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AUTOMOTIVE INDUSTRIES

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NEW YORK—THURSDAY, DECEMBER 28, 1922

No. 26

Chevrolet Copper-Cooled Car Ready for Market

New line, developed at General Motors Research Laboratory, embodies advanced ideas in cooling. Copper radiating fins welded to cylinder barrel. Four cylinders cast separately. Five-passenger model \$725. Present Chevrolet line continued.

By J. Edward Schipper

THIS is the first complete technical description of the Chevrolet copper-cooled car to be presented to the industry. The long period of experimental work which preceded the announcement of this new line has made the industry keenly interested in its engineering details.

Automotive Industries is able to give the complete story of this new model in time for engineers and executives to study the design carefully before actually seeing the car at the New York Show.

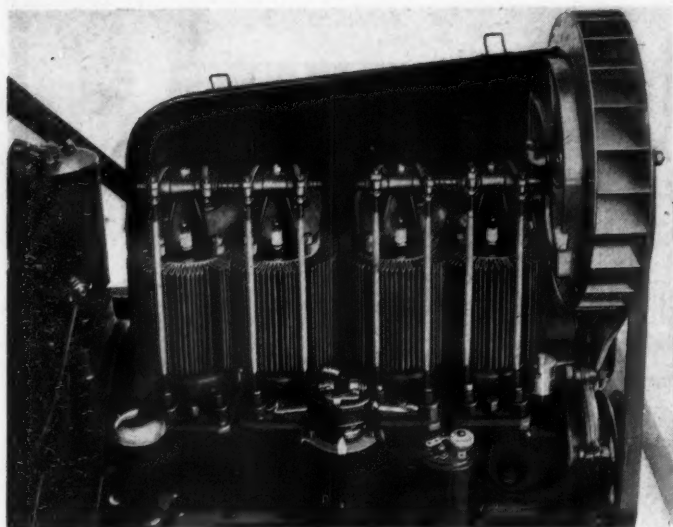
PRODUCTION has started and shipments are being made to distributors on the Chevrolet copper-cooled car. The price of the touring car will be \$725. This car, which, for the past two years has aroused the interest of the industry, was developed at the General Motors Research Laboratory at Dayton and turned over to the Chevrolet Motor Car Co. for production. Interest in this car has been keen because it marks the introduction to the American market of a low-priced, air-cooled car. The present Chevrolet line will be continued.

In the development of the air-cooling system, the General Motors Corp. has successfully accomplished, on a production basis, the feat of electrically welding copper to iron. By the use of this process the copper

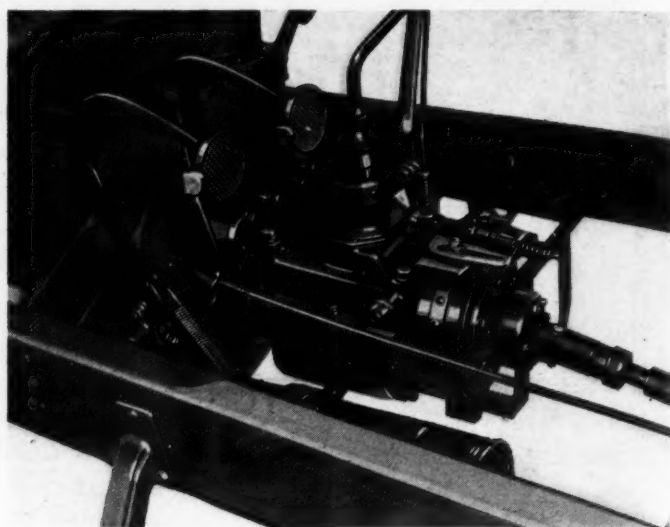
cooling fins are made an integral part of the cast-iron cylinders, and advantage is taken of the excellent heat conducting qualities of copper. Rolled copper has a heat conductivity of more than double that of cast iron. Because of the use of copper cooling fins the term "copper-cooled" is used in designating this new product.

In a water-cooled car, the water simply acts as an agent for transferring the heat from the cylinder to the radiator. In this new engine the water vehicle has been dispensed with and instead, the radiator has been mounted directly on the cylinder barrel.

Because of the increased conductivity of the copper fins as compared with cast iron, the characteristics of the copper-cooled engine are claimed to be very



New Chevrolet copper-cooled engine with part of draft tube removed to show cooling fins and blower inlet. Note vertical position of starting motor



Gearset and propeller shaft brake, showing cam operating mechanism

much closer to those of the water-cooled engine than are those of engines in which cast-iron cooling fins are employed. Because of the more rapid flow of heat through the copper ribbing and because of the method of manufacturing the copper ribs out of copper sheet, not only is the heat conduction and radiation more rapid as compared with that of the cast-iron fin, but it is also possible to utilize an increased area of radiating surface, since the copper is much thinner than any cast rib can be. From a standpoint of performance, the use of the copper fin has resulted in an engine which gives about the same mean effective pressure, using about the same compression ratio, as water-cooled engines of the same size.

How Cylinders Are Manufactured

To manufacture satisfactorily the copper-cooled engine, it has been necessary to develop machinery which will form the copper ribs and apparatus which will commercially handle the electric welding of the formed ribs to the cylinders. This manufacturing equipment has been developed at the Dayton laboratory coincidentally with the development of the cylinder itself. The finished cylinders are manufactured at Dayton, the copper fins being made in a special machine which takes the sheet copper and forms it into the proper shape, reducing the depth of the fins or loops at points where clearance for the valve push rods and adjacent cylinders is required. The copper is so formed that the loops are closed at points adjacent to the cylinder barrel and in such a way that a continuous band of copper is in contact with the

outer wall of the cylinder, which latter is machined both inside and out.

While the cylinders are necessarily manufactured singly, they are assembled in pairs. There are two detachable heads, each covering two cylinders of the four-cylinder engine. Each pair of cylinders is brought relatively close together, but a full spacing is allowed between the two center cylinders so as to permit of the full length of fin between cylinders No. 2 and No. 3. Between cylinders 1 and 2 and between cylinders 3 and 4, which are closely adjacent to one another, the fins are graduated in size so that there is no interference. Because the fins are shorter at this point, this would produce a warmer part of the cylinder barrel were it not for the fact that the intake valve is on the same side on the cylinder. This construction facilitates preheating of the incoming gases and permits of a Siamese intake layout. The exhaust valves are placed adjacent to the outer side of each cylinder in each pair where the ribs or fins are free from interference and where the maximum cooling effect is obtained. The longer fins and the hot exhaust gases balance against the shorter fins and cool intake gases so that thermo-couples placed at various points about the engine disclose very little difference in temperature at any point.

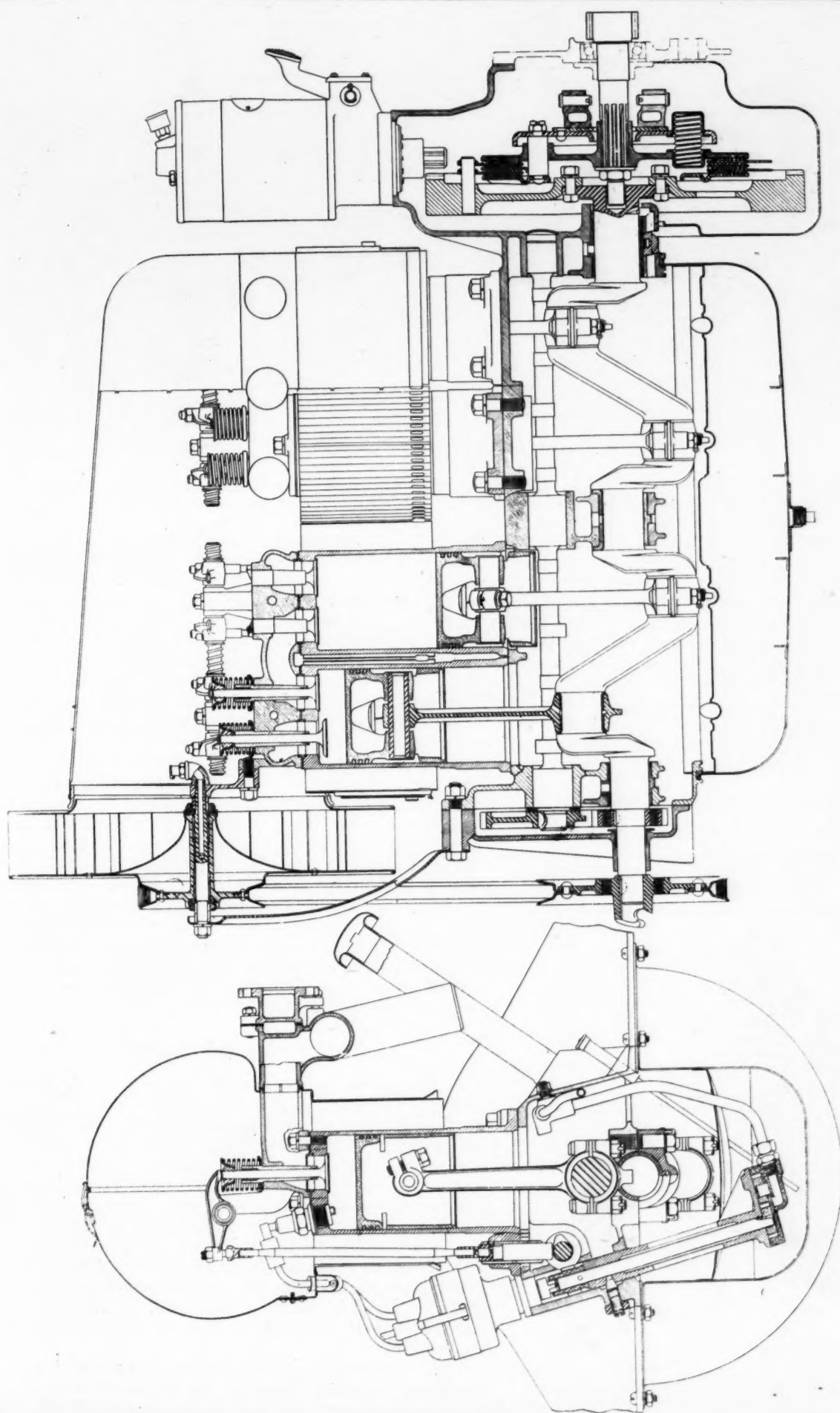
This new engine is the first square one to be placed on the market for some time. The bore and stroke are each $3\frac{1}{2}$ in. With a compression ratio of 4 to 1, which is standard, a maximum b.h.p. of 22 is delivered at 1750 r.p.m. A restricted intake manifold is used to

Specifications of Chevrolet Copper-Cooled Car

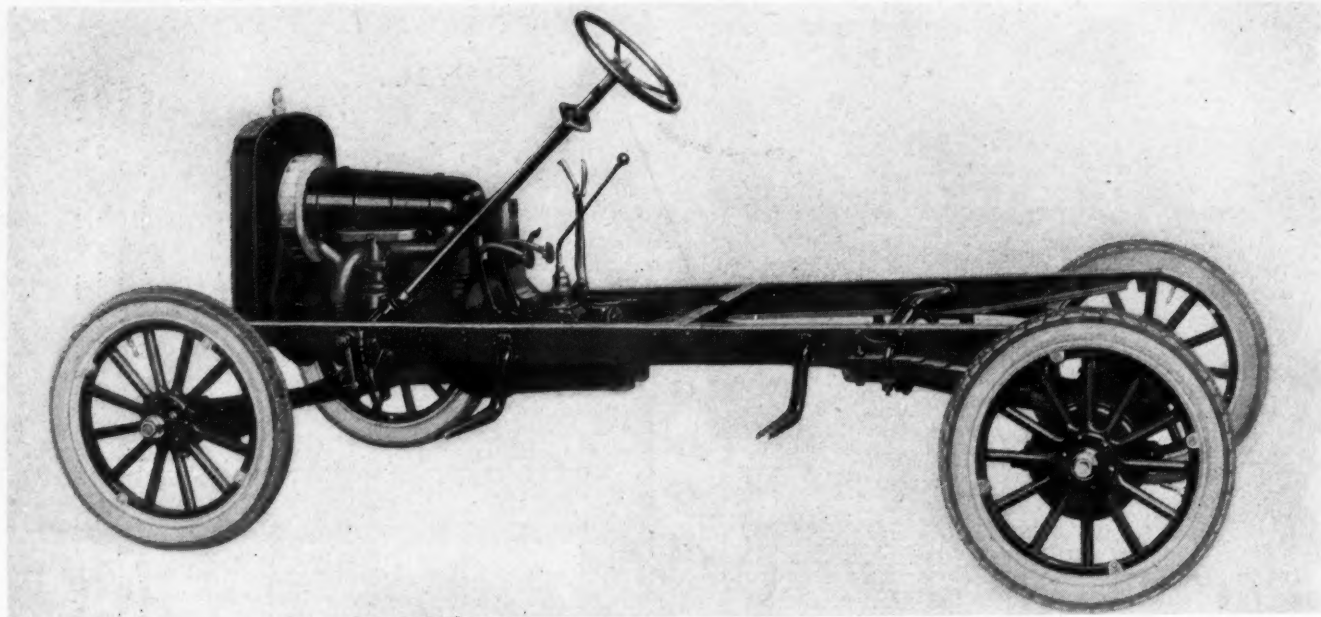
Bore, $3\frac{1}{2}$ in.
Stroke, $3\frac{1}{2}$ in.
No. of cylinders, 4.
Cylinder head, detachable.
Cylinders cast, individually.
Pistons, Lynite.
Piston weight, 1 lb. 5 oz.
Connecting rod, length, $6\frac{13}{16}$ in.
Connecting rod, weight, 1.11 lb.
Valve material, Silchrome
Camshaft drive, metal gear.
Oiling system, gravity-splash.
Oil pump type, gear.
Carbureter, Carter.

Intake, exhaust heated.
Fuel feed, vacuum.
Electrical system, Remy.
Battery, Willard.
Spark control, automatic.
Clutch, multiple disk.
Number of disks, 4.
Low speed reduction, 3.32 to 1.
Second speed reduction, 1.77 to 1.
Third, direct.
Reverse, 4.27.
Rear axle reduction, 4.44 to 1.
Universal joint, Mechanic.

Rear axle, semi-floating.
Propulsion, through springs.
Torque, through torque arm.
Final drive, spiral bevel.
Front spring, quarter elliptic.
Rear spring, quarter elliptic.
Foot brake, external on rear wheels.
Hand brake, external on drive shaft.
Steering gear, Jacox.
Turning diameter, 39 ft.
Tire size, 30 by $3\frac{1}{2}$ in.
Wheelbase, 103 in.
Speedometer, Champion.



Vertical sectional views of the new Chevrolet copper-cooled engine and horizontal section of clutch. Note arrangement and type of construction of blower which draws air from around base of cylinders, through and around the copper cooling fins and over the cylinder heads. The latter are made in two parts. That portion in which the valves seat has a thick section and is integral with the cylinder barrel, while the inlet and exhaust passages are cored in as separate casting which covers two cylinders. Note also the arrangement of the starting motor. The gears are a special type, not bevel, although the drive is at right angles. The conventional screw shifting device is eliminated



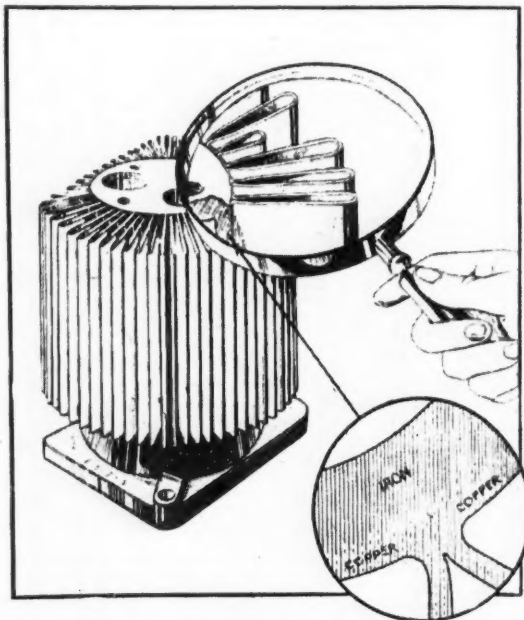
Chevrolet chassis with copper-cooled engine. Wheelbase is 103 in. Quarter elliptic springs are fitted front and rear. The draft tube which encloses the cylinder heads and valve gears is shown closed

limit the power output of the engine and prevent car speeds in excess of 45 miles per hour on the standard gear ratio of 4.44 to 1.

The standard touring car weighs 1670 lb. and has a wheelbase of 103 in. With the exception of the new cooling system, there is nothing radical about the design of the car. In fact, the chassis is, in its general appearance, very much like the Chevrolet Superior model, although close inspection reveals a number of detail improvements all through. In spite of the close resemblance, very few of the chassis parts are interchangeable with those of the Superior model.

Unique Features of Cooling System

The cooling system, however, differs materially from anything ever placed on the market. Cooling is by air drawn through and around the fins and over the cylinder



Sketch showing arrangement of the copper cooling fins on the new Chevrolet engine. They are made from sheet copper and are welded to the cast-iron cylinder barrel

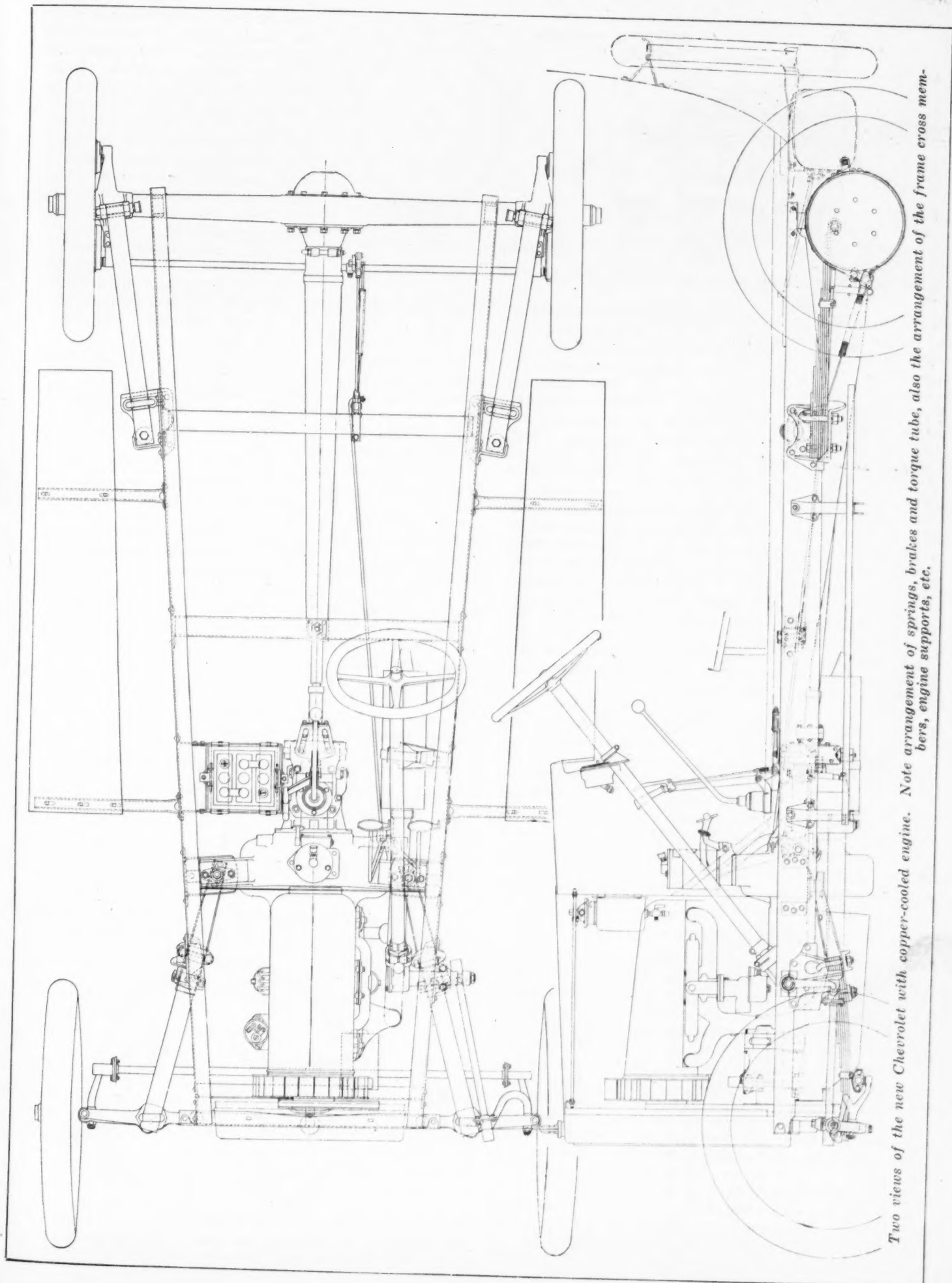
heads by a centrifugal blower made largely from sheet aluminum alloy. This blower is in front of the engine and is driven by a special form of V-belt from a pulley on the crankshaft. The fan runs at about one and one-half times engine speed. Air enters at the bottoms of the fins around the cylinders. A light steel stamping forms a tubular draft tube which fits closely around the cylinders, so that air can enter the fan only by passing upward, through and around the copper fins and through the space above the cylinders. The hot air is exhausted around the fan periphery.

An interesting point in connection with the design of the engine is the use of the thick metal head which not only provides better conduction, but also maintains a true valve seat. In manufacture, the final valve seating is very carefully done after the valve guides are in place, the guides acting to locate the pilots of the seating tools. A heat insulating gasket is placed between the cylinder head and the cylinder to prevent heat from flowing back from heads to the cylinders. This reduces the heat load on the cooling fins. The valves are mounted off-center to make room for the spark plugs in the head. This results in an unusually effective head construction from the heat removal standpoint.

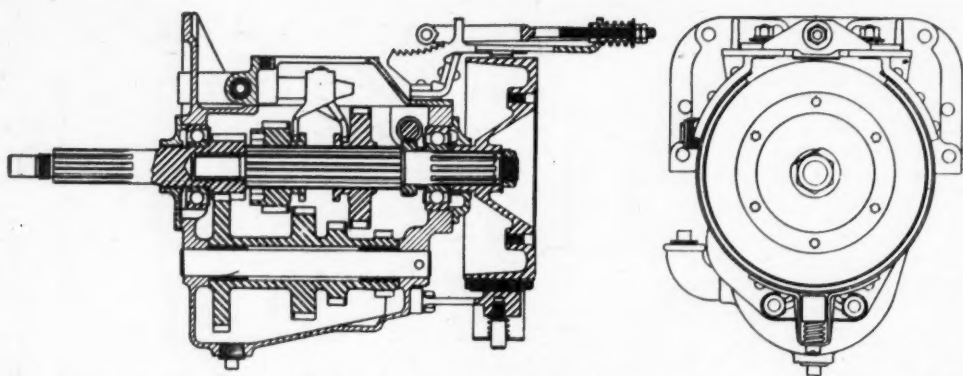
Blower Is Belt Driven

A vital point in the design of the cooling system is naturally the means for driving the fan. The V-belt employed has a woven cord construction on its neutral axis and a durable elastic material on either side of the neutral axis permitting of the flexing necessary for the drive. A considerable amount of experimental work was done on this belt at the laboratory in Dayton. The engineering department has found that with the construction used, a practically unlimited life can be obtained. The drive for the fan is triangular, the belt passing around the crankshaft, fan and generator pulleys. Adjustment for the tension of the belt is secured by swinging the generator, which is mounted on the left side of the engine.

The valve drive is quite similar in general design to the Superior model Chevrolet, but is not interchangeable with it. The overhead valves are operated through aluminum push rods, aluminum being adopted not only for



Two views of the new Chevrolet with copper-cooled engine. Note arrangement of springs, brakes and torque tube, also the arrangement of the frame cross members, engine supports, etc.



Gearset, showing also the arrangement of the hand operated propeller shaft brake

its lightness and consequent reduction of the inertia of the reciprocating valve parts, but also because its expansion rate is such as to compensate for the cylinder expansion and, consequently, to reduce variation with temperature change in the push rod clearance. The camshaft is driven by a single gear and the valves are operated through mushroom tappets. The rocker arms are carried on self-lubricating grapho-bronze bushings. This is the combination graphite-bronze bearing recently developed at the Dayton laboratory, and is made from powdered graphite and bronze.

Lubrication is by a pump and gravity feed system, the pump merely being a lifting device which takes the oil to a central distributing point from which it feeds through three gravity-flow tubes to the three main bearings. The oil pump body is cast iron with a die-cast bottom. The gears are bronze forgings. The branch leads are $\frac{1}{4}$ -in. tubes, the main feed to the distributing point being $\frac{5}{16}$ in. All of the other bearings in the engine are lubricated by splash. A special drainage design has been worked out so that there is no slopping about of the oil in the case.

The electrical equipment is Remy throughout for ignition, lighting and starting. The generator mounting is on the left side of the engine, as previously described. The starting motor is mounted in a vertical position on the flywheel housing. This permits of a straight mechanical shift for starting. There is no manual spark advance, this being entirely taken care of by the automatic Remy feature. The carburetor is a Carter, 1-in. size, fed by vacuum from the gasoline tank mounted on the rear of the chassis. The throttle control is by accelerator pedal and lever on the dash, there being no quadrant on the steering column.

Multiple-Disk Clutch Employed

The clutch has two driving plates carried by three driving pins in the flywheel. The clutch is faced with asbestos cord fabric applied to the driving plates which act on the two outside-driven plates and on a floating plate between them. The malleable hub is splined on the clutch shaft and has six pins, three of which are for driving and three for alignment. There is one floating plate on the pins. The clutch pressure is provided by six springs mounted in cups. Each spring is placed between two cup members, the springs holding these apart and thus providing the pressure necessary for clutch engagement. The throwout is a bronze casting with a core acting as an oil pocket. This throwout is supported on a fork which sets in a clevis and is secured by a pin. The bronze shoe clears the shaft and the fork is operated by the lever. The bronze shoe acts as the clutch brake. There is one adjustment on this clutch, this being for pedal position.

The gearset is a three-speed, selective type, the coun-

tershaft gears being integral with the shaft, which is mounted on plain bearings. New Departure bearings are used on the main shaft. The shifter is overhung from the front end of the housing to permit of the brake ratchet and lever being mounted on the rear. The propeller shaft brake, which is hand operated, acts on a drum which performs the dual function of a brake drum and the propeller shaft driving flange. Actuation of the hand brake is accomplished by two cams acting in a double cam plate. As the plate is pulled by the

brake lever, these cams, acting in the cam grooves, pull the ends of the contracting band together. This brake has a $6\frac{1}{2}$ -in. drum and a 2-in. face.

The speedometer drive is also located on the gearset, being driven off a worm on the main shaft.

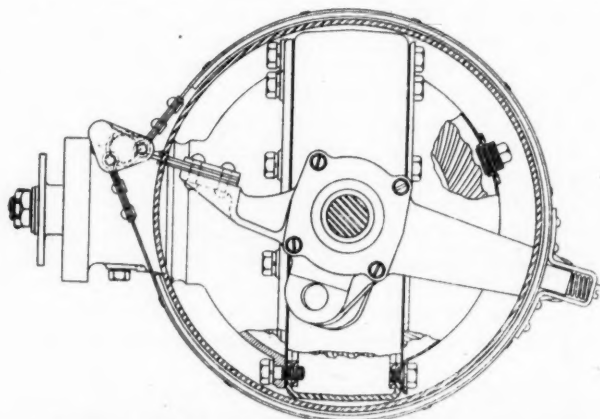
The drive is through a Mechanic metal universal joint to a semi-floating rear axle. The propulsion is taken through the rear springs and the rear axle torque is taken through a torque arm.

The rear axle is unusual in that it incorporates a banjo housing which is a type of construction not generally found on a car in this price class. This has a malleable center and end castings to which latter the rear springs are attached. A two-row, New Departure and a Hyatt bearing carry the pinion shaft, two New Departure bearings are used at the differentials. The differential is a two-pinion cage type. A fixed adjustment is employed on the rear axle because it is considered that a correct tooth bearing is secured in only one position of the gears, consequently shims are used for taking up the differences due to manufacturing tolerance. A ring is employed as a thrust shoulder behind the ring gear and the shims for adjustment at the factory are inside the ring. The differential bearing takes the wheel thrust through the cage.

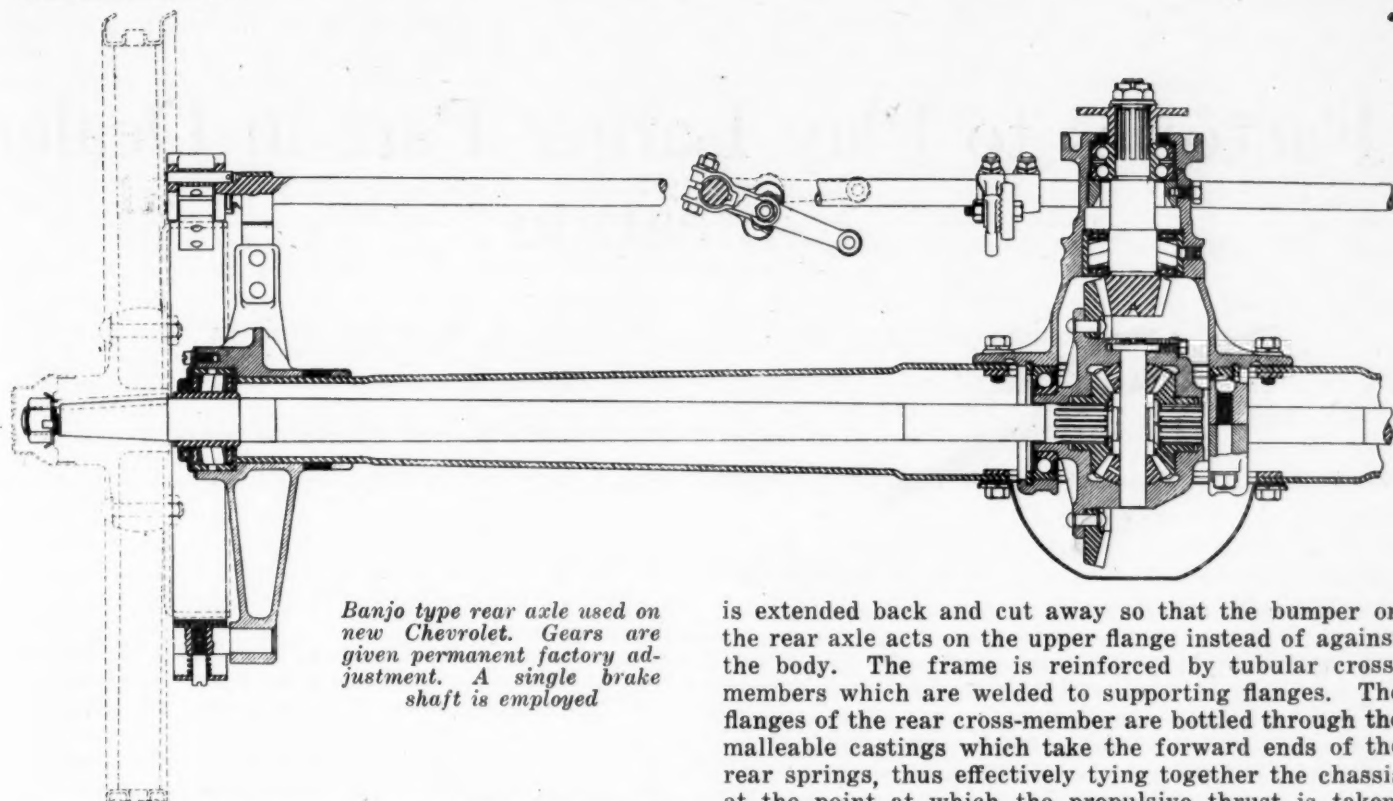
Contracting Foot Brakes on Wheel Drums

The rear wheel brakes are of the contracting full-wrapping type without adjustment at the rear wheels, the adjustment being provided on the linkage. The layout of the actuating mechanism is such that deflections in the suspension springs do not cause pedal motion. The brake drum is 11 in. in diameter and has a $1\frac{1}{2}$ -in. face.

The pressed steel torque arm is secured at its rear end by wrapping it about the pinion shaft housing. A



Band brake on rear wheel drums. The malleable iron anchorage and banjo type axle center are also shown



Banjo type rear axle used on new Chevrolet. Gears are given permanent factory adjustment. A single brake shaft is employed

groove is rolled in the arm and it is fastened by means of clamps with through bolts. The torque arm material is cut away to provide clearance for the brake shaft and to leave an opening to give access to the bolts which must be removed in taking down the propeller shaft. The front end of the torque arm is secured to the central frame cross-member by a universal connection.

The spring suspension is quarter-elliptic throughout. This is used largely because it eliminates shackles and most wearing parts on the springs and also because the load on the axles is brought close to the wheels. It is further claimed for this spring suspension that the unsprung weight is much reduced because the springs themselves are mostly sprung weight. A single clip is employed to hold the main plate of each front spring to the front axle. The No. 2 plate goes through the clip and is kinked up as a safety precaution in case of main leaf breakage. At the back end of the front springs two clips are employed, one is passed through a hole in the spring bracket and the other clip passes over a horn on the end of the clip. A pressed steel member passes under both clips and extends back to the rear motor support, the frame, motor support and this bracket being securely bolted together, thus tying the whole structure together at this point and reinforcing it in such a way as to take the twist resulting from the quarter-elliptic front spring and also the stresses set up in pushing the front axle.

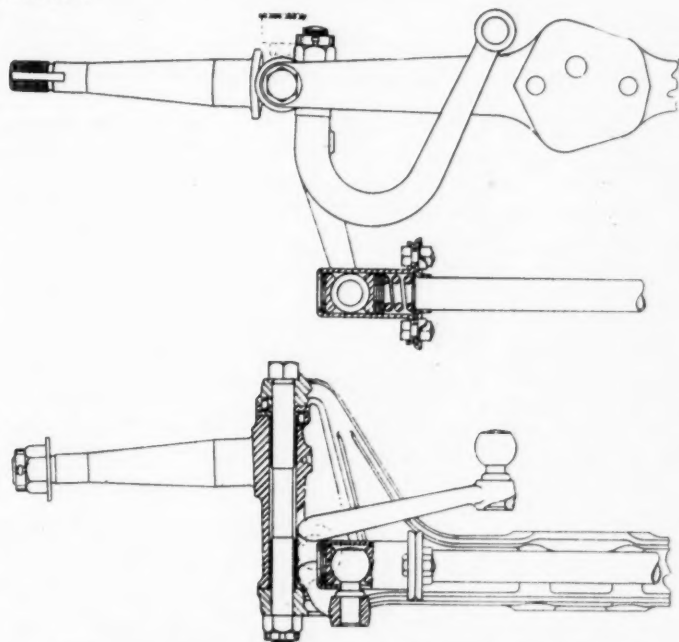
Rear Spring Arrangement

The rear springs have an eye at their rear end, the only moving bearing in the suspension. The eye bolt passes through the spring eye and two ears thrown up on the spring perch on the rear axle. At the front end of the rear spring is a malleable casting with an angle flange. A bolt passes through this flange to take the drive, and, in addition, there is a clip which passes around the spring and through the casting. This arrangement helps to distribute the driving stresses.

The frame side members are of pressed steel formed into a channel with a 47/16-in. web and 1 3/4-in. flanges. It is made from 1/8-in. stock. The rear end of the frame

is extended back and cut away so that the bumper on the rear axle acts on the upper flange instead of against the body. The frame is reinforced by tubular cross-members which are welded to supporting flanges. The flanges of the rear cross-member are bottled through the malleable castings which take the forward ends of the rear springs, thus effectively tying together the chassis at the point at which the propulsive thrust is taken. The rear part of the engine, together with its supports, also acts as a cross-member. These supports are deep webbed piece riveted to the main frame. The engine is supported at the front upon a cross-member to which it is attached by bolts through two lugs on the timing gear case.

The chassis will be put out with five bodies; a two-passenger roadster, five-passenger touring car, two-passenger coupe, five-passenger sedan and four-passenger sedanette. All of these resemble in general appearance the bodies used on the Superior line. In fact, with extremely minor variations, the bodies are interchangeable with the Superior line. The prices on the various models are \$200 more than those of the corresponding Superior models.



Front axle on new Chevrolet. The tie-rod has ball ends, neatly enclosed. Knuckle thrust bearings are plain washers

Factories to Play Larger Part in Dealer Education

Sales managers agree that more active work must be done in helping retailers. Distributors have fallen down on the job. Assistance may be given through distributors or direct from factory. Latter method involves heavy increase in responsibility.

By Norman G. Shidle

DEALER education problems are rapidly becoming acute. A very large number of real merchandisers are needed to sell automotive products throughout the United States. Order takers will no longer secure the distribution needed by the manufacturer. There are not enough good dealers to go around. Even the strong, well-established companies, which might be expected to have the pick of dealers, are clamoring for more retail representatives capable of actually merchandising automobiles.

The remark was made to the sales manager of one of these big companies recently that "there are not nearly enough dealers to fill the needs of manufacturers."

"I disagree with that statement," he replied. "There are too many dealers—but not nearly enough good ones."

Since it is only the good ones who will count from now on, manufacturers are trying to develop more of that kind.

Good dealers can be obtained in one of three ways:

1. They can be stolen from another manufacturer.
2. They may be brought in from other lines of merchandising and built up into first-class automotive dealers.
3. Dealers now in business can be helped and educated so as to become efficient merchandisers.

Educational effort on the part of either the manufacturer or distributor is the basis of two of these methods. The first mentioned may be entirely disregarded in considering the problem from the viewpoint of the whole industry. Manufacturers who rely entirely on taking dealers from competitors for accretions to their own force are dodging their share of the responsibility for helpfulness and education and probably will not benefit either themselves or the industry in the long run.

Dealer education is an essential part of future marketing programs. Sporadic efforts have been made along this line already, but much of the literature and speech-making which has been labeled "dealer education" had no right to the name.

DEALER education must consist of 10 per cent inspiration and 90 per cent practical assistance.

It must involve aid in solving the problems and improving the methods which the dealer is handling in his every day work.

It must consist of a more detailed, more specialized, and more individualized application of the best merchandising principles.

In addition, it must involve the element of timeliness. The dealer must get immediate assistance on specific problems when needed, in addition to general education along the lines of good merchandising. But, on the other hand, the giving of this specific help from time to time should not obscure the necessity for a broad general plan of dealer education.

Such dealer education can be carried on in two ways:

1. It can be left fundamentally to the distributor.
2. It can be carried on directly by the manufacturer.

The first method is that generally in use to-day, frequently with some modifications. The second would involve practically the elimination of the distributor in the marketing scheme and the signing of dealer contracts direct with the factory or factory branches.

Analysis of what has been done is always the best first step in seeking better future methods. With certain notable exceptions, the practice throughout the industry has been to have distributors, who in turn sign up a number of dealers in the territory allotted to them.

THE factory usually has nothing to do with the dealer contract and, theoretically, nothing to do with the education and improvement of dealers. The factory, theoretically, confines itself to the selection and assistance of good distributors. The selection and training of dealers within the given territory is entirely the responsibility of the distributor.

Hundreds of modifications of this theory are now in practice. Every manufacturer has found it impracticable to leave the entire responsibility for a territory in the hands of the distributor. The distributor himself might be making a good profit, despite the fact that the dealers under his charge were somewhat deficient both as to quantity and quality. From the manufacturer's point of view maximum distribution was necessary to maximum production, but the distributor sometimes reached a point where increased sales in certain parts of his territory cost more than they were worth to him. From a factory standpoint, however, these increased sales were both desirable and necessary.

The distributor was not really competent to carry on an effective dealer education campaign in many cases, even where he considered it to his advantage to do so.

Consequently, the factory, needing maximum distribution, found it necessary to learn more about the possibilities of the territory of each distributor and then to

urge the distributor to build up a better merchandising force to realize those possibilities. This is the practice in most cases to-day, although there is much urging done by factories without a great deal of accurate knowledge about maximum possibilities.

WHEN the factory district manager urges a distributor to take more cars and insists that there is a market for those cars in the given territory, he is frequently unable to back up his statements with facts and figures. It is simply his word against that of the distributor, the latter claiming, usually with justice, that he knows more about the territory than does the district manager.

This situation has led to considerable friction, and has not affected favorably the development of adequate dealer education programs by various distributors.

A third stage is being reached by some of the more important factories. They have realized the necessity for backing up words with information, and are making thorough economic studies of the entire country. They are trying, for the first time, to get something like an accurate picture of market possibilities by territories.

Methods of doing this are still in the experimental stage and every factory will know more about the subject ten years from now. Nevertheless, studies already made and put into use by important companies have had a very favorable effect. They may not be mathematically exact, but they are far more nearly accurate than the unsystematic guesses of the past. They have revealed the inadequacy of the distributor educational and merchandising program in many cases, and have enabled manufacturers to give distributors more help in intensive cultivation of territories than ever before. The manufacturer with this more extensive market knowledge may use it simply as a club over the distributor. He may properly insist that the territory is worth more than the distributor is getting out of it, and then simply tell the distributor to get the increased business possible or move on.

On the other hand, he may use this increased knowledge to help the distributor in the solution of the latter's problems. The manufacturer may put on district managers capable of interpreting this information in terms of the distributor's needs; managers who can help the distributor map out and put into operation a really effective dealer education plan.

Both methods are now being used by manufacturers who have made more or less accurate studies of territorial markets. Those using the latter method are in some cases going so far as to employ special men whose sole duty is to travel with the wholesale man of the distributor and help in solving individual and general dealer problems within the territory. In such cases, the factory practically is providing the ideas, methods, and plans for dealer education, but is still asking the distributor to provide the means of putting them over.

The various steps outlined of the manufacturer's increased participation in actual dealer education have been taken gradually and in most cases almost unconsciously. Each step has been taken as a matter of necessity in

solving a particular problem or set of problems.

A group of five important sales managers, representing cars in all price classes, are a unit in declaring that the activity of the manufacturer in dealer education work will continue to increase and that the increase must be more rapid from now on. One of them says, for example:

"It is absolutely essential that the factory have a good control over distributor relations with dealers, even though contracts are direct with distributors. The distributor wholesale man too frequently thinks only of getting rid of as many cars as possible. He is likely to force cars, just at times when cars ought not to be forced. He should be trying, instead, to make better merchants. You can't depend on distributors to do the necessary educational and assistance work for dealers unless factory supervision comes in very definitely."

Another says:

"Dealer education is very largely in the hands of distributors at present, but the distributor has fallen down in almost every instance. The factory can urge them to do more work along this line, but few distributors do it. They say they can't afford it.

"Nevertheless, this educational work must be done, and the factory will have to do it. It will probably mean the entire elimination of the distributor in the long run."

"Dealer education is of primary importance at the present time," says a third, "and the factory will have an increasingly important part to play. Much of this education must be carried on through district managers and traveling men."

This brings us to a consideration of the second main method of handling dealer education, that is, carrying on these activities

directly from the factory. One main point should be understood at once.

Whether distribution is accomplished through branches or distributors, the actual marketing cost probably will be about the same. The installation of branches does not eliminate the distributor's profit, as the function of the branch is identical with that of the distributor. This question will not be discussed here at length, as it has been ably and adequately handled by Harry Tipper in *AUTOMOTIVE INDUSTRIES*, issues of Jan. 19 and 26, 1922.

The possibility remains, however, that if the factory handled dealer relations direct, put over dealer educational work more efficiently, made better merchandisers of the dealers, and thus increased distribution, the unit marketing cost might be decreased even though the actual cost remained the same.

POSITIVE and emphatic opinions supporting both sides of this question can be obtained from many sales managers, all of equal importance and repute. The simple facts of the case are that probably no one is in a position to answer the question to-day on a basis of actual cost studies, involving all the elements. The deciding factor in most cases, moreover, is the human element; the ability and aspirations of the distributor or the branch manager in a particular case.

Even when it is granted that direct factory control

MANUFACTURERS have decided that more good dealers will have to be made. They aren't being born fast enough. There is considerable difference of opinion, however, as to how the making shall be done.

It is generally agreed that dealer education cannot be left entirely to the distributor. Some sales managers are trying to help and urge the distributor to better efforts. Others are in favor of eliminating him and taking over the job themselves.

This article points out the advantages and difficulties of both methods, gives the opinions of some prominent sales executives, and discusses what future action is likely to be best for the industry.

would make dealer educational work more readily conformable to factory ideals, three requirements of direct factory control must be fully recognized:

1. Greatly increased capital investment will be necessary.
2. Increased operating expense will accrue, because the factory assumes the running expenses previously absorbed by the distributor.
3. The factory must be thoroughly equipped with a comprehensive dealer education plan and must be ready to put that plan into operation efficiently and effectively.

THE first two items may be passed over briefly, as practically every executive recognizes them fully and is unlikely to embark on any plan that he is not financially able to handle.

The third necessity is not so fully recognized. Nearly every factory seems to assume, as axiomatic, that it knows what is needed in dealer education and would be perfectly capable of carrying out its plans.

Such a program would involve such matters as the following:

1. A well thought out plan which can be given to the dealer to enable him to put his business on a sound financial basis in the beginning. This would involve a concrete discussion of the relation of capitalization to amount of annual business, turnover, etc. It might be called a plan of fundamental financing for the dealer.

Then traveling men would be necessary who would be capable of properly adapting that general, concrete plan to the circumstances and needs of the individual automotive dealer.

FEW factories have made any detailed study of dealer finance. They understand it in a general way and can distinguish between sound and unsound balance sheets, but do not have readily available a specific outline plan upon which a dealer education campaign along these lines might be based.

2. A similar plan for dealer accounting, which would enable the dealer to put his business records in such shape that he would really know how much money he makes. Such systems as the Motor World Accounting System are available, of course, but here, too, traveling men capable of interpreting general systems for individual needs must be ready for operation.

3. A comprehensive service plan, which will give the dealer a real education in the meaning and possibilities of good service, and which will show him how to adapt and operate that general plan in his own shop. A flat rate system would also be a desirable addition to such a plan.

4. A thorough analysis of sales possibilities by territories. This is necessary, if the factory is to carry on its dealer education campaign effectively. Such an analysis

will give the factory a reasonable idea of what to expect from the dealer and will enable it, in addition, to show the dealer how to apply market analysis methods to his own work in a specific manner.

5. The factory would have to establish some means by which it could keep in close touch with detailed current conditions in a large number of small territories.

6. A dealer advertising plan would have to be laid out in detail and operated in connection with a large number of small units.

7. A proper stock keeping system, adaptable to dealer establishments, would be necessary. The factory or its traveling men would have to be equipped to show the dealer how to use and adapt this system to his own business.

8. The factory should be prepared to give the dealer a scientifically worked out plan, telling him what stock of parts he ought to have on hand in proportion to the cars operating in his territory.

OTHER necessities could be mentioned, but those given are sufficient for illustrative purposes. If the factory is to take over the entire work of dealer education, it must be fully equipped with ideas, machinery, and organization for carrying out the work. Otherwise it will do a worse job than has the distributor, because it will have to operate a large organization, all of which will be likely to stand or fall on the basic efficiency of the plan and the home organization. So long as distributors are handling the matter there may be many bad spots, but there are sure to be some good ones.

Direct factory control and operation of dealer education may or may not be the ultimate solution to the problem. It is evident, however, that few factories are equipped at the present time to carry out such a plan immediately with much better chances of success than the distributors have had.

THE best plan would seem to be for the factories to continue the work of investigation and experimentation in connection with dealer education as they have been doing in recent years; to develop further the active and practical assistance being given to distributors in dealer education; to thus equip themselves gradually to better handle a direct dealer education problem involving the entire country if it ever becomes necessary to do so.

Whatever changes are made along this line must come gradually if they are to be successful, because their success depends fundamentally upon the growth of knowledge in the particular field—and that growth is still comparatively slow. Hard work and hard study of the problems involved will do more good in the next few years than an attempt at solution simply by a radical change in the mechanics of operation.

ONE of the large electrical equipment manufacturers has developed a plan of registering electrical units with the factory as soon as sold. This plan has been adopted to insure the proper rendering of guarantee service.

This concern, the American Bosch Magneto Corporation, requires the dealer of automotive products to fill out a card at the time the product is sold which shall give all particulars regarding the electrical unit and name and address of the buyer. The card is then immediately forwarded to the Bosch factory.

On receipt of the card the factory immediately notifies the Bosch service station that such a unit is now in its territory and informs the buyer where to go to get authorized service, at the same time furnishing him with an identification card which entitles him to free service for the period covered by the guarantee.

This system enables the factory to know in what territories its product is being sold and hence to keep the service stations adequately supplied with replacement parts. It is claimed that much better service and greater co-operation have resulted.

Midwest Adds to Line of Passenger Car Engines

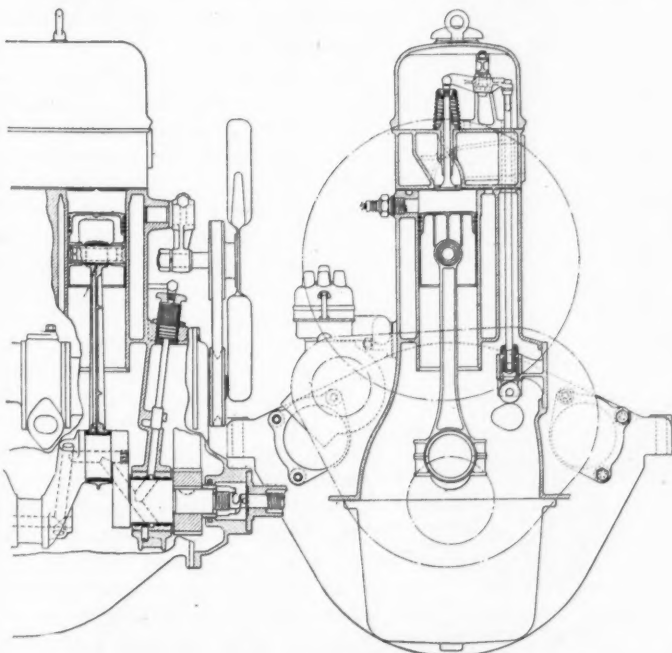
New six has displacement of 268.4 cu. in. and develops 70 hp. at 3000 r.p.m. Features include "wave line" connecting rod, pressure lubrication controlled by manifold vacuum, chain driven camshaft and 1-9/16 in. overhead valves.

AS stated in our news columns last week, the Midwest Engine Co. has announced a new six-cylinder passenger car engine of 3 3/8 in. bore and 5 in. stroke. This is an overhead valve type following the same general lines of the fours produced by the same company, but incorporating certain additional features. The connecting rod is unusual in that the thickness of metal in the flanges of the section is not of uniform thickness but varies from point to point in such a way as to make wavy inner facing surfaces of the I-section. This construction is said to break up vibrations to which rods made in conventional way are subject, or to prevent their concentration at any one point on the rod.

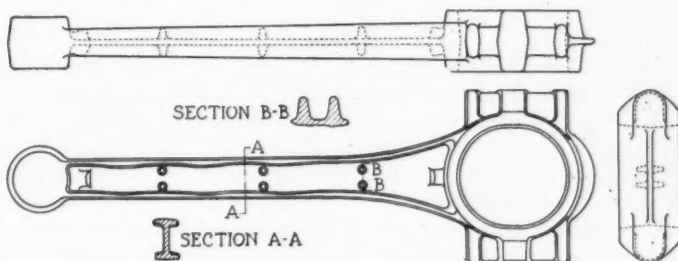
Clean External Appearance

Pushrods are carried inside the outer wall of the cylinder block instead of being inclosed by tubes as in the four-cylinder models, a feature which helps to give an unusually clean external appearance.

Grey cast iron pistons measure 4 9/32 in. in length and have four 1/8-in. rings, all of which are above the pin. The latter is free to float in both the rod and the piston bosses, bearing metal plugs being used to prevent scoring



Sectional views of the new Midwest six-cylinder passenger car engine



"Wave line" connecting rod used on the Midwest six

of the cylinder. The piston is reinforced by ribs, which also assist in cooling.

Valves seat direct in the detachable head, special care being used to direct the water entering the engine from the pump around the spark plug and the valve seats. The valves are of special alloy, measure 1 9/16 in. in the clear and have 13/32 in. lift. The stems are 3/8 in. in diameter. Rocker arms are not pivoted on a shaft but are arranged to bear against flat surfaces of the adjusting screw so that they rock on this flat surface. They are held in alignment by centering pins as shown in the accompanying section. Bearing surfaces are hardened and ground to minimize wear.

Large Diameter Crankshaft

The crankshaft measures 2 1/2 in. in diameter at all bearings. The rod bearings are 1 3/4 in. long and the main bearings, front, center and rear, measure 2 1/4, 2 1/2 and 2 3/4 respectively. Wrist pins are 1 in. in diameter. Main bearings are steel backed white metal; while the white metal is cast direct in the big ends of the connecting rods. None of the bearings is hand scraped but they are bored, reamed, broached and burnished. The steel backed main bearings are ground on their outer surface so as to seat well in the case, and do not require reaming when in place. A clearance of 3 to 5 thousandths in. is allowed for the oil film. The crankshaft is drilled and oil is forced to all bearings by a gear pump. A spring loaded plunger, the position of which is controlled by the vacuum in the inlet manifold, is placed at the outlet end of the crankshaft with a view to controlling the pressure on the oil in proportion to the load. Oil which issues from the by-pass is used to lubricate the chain which drives the camshaft. Valve parts are lubricated by oil mist.

The bellhousing is the No. 3 S.A.E. standard and the flywheel is also machined to dimensions conforming to those specified in S.A.E. standards.

High Fuel Economy Obtained in New Waukesha Engine

One hundred and ten ton-miles per gallon of gasoline shown in tests. Features include aluminum alloy pistons with two double rings each, Ricardo type combustion head, high compression, valve rotators, and radiated bearings. Experimental data given.

By P. M. Heldt

A NEW engine of 4 x 5 $\frac{3}{4}$ -in. cylinder dimensions has been brought out by the Waukesha Motor Co., which, while it does not differ much from the model which it replaces as far as outside appearance goes, shows many important changes in the working parts. This engine has been designed chiefly with a view to sustained economy. It is claimed that an experimental truck in which one of these engines is installed has shown an efficiency of more than 110 ton-miles to the gallon. Some tests under rather unfavorable conditions were made with this same truck in the presence of a representative of AUTOMOTIVE INDUSTRIES early in December and the results will be given further on in this article, after the new mechanical features of the engine have first been explained.

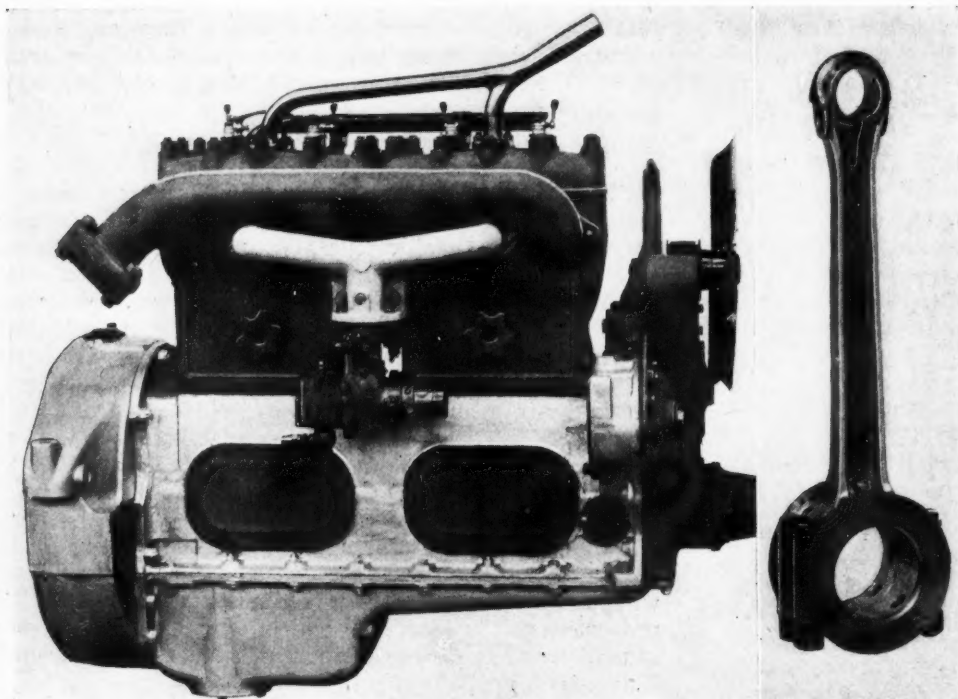
Fuel economy, as is well known, depends to a large extent upon the compression ratio employed, and it should be pointed out first of all that an exceptionally high compression ratio is used. The engine on the ex-

perimental truck or bus has a ratio of 4.56 to 1 and an engine tested on the block, a ratio of 4.75 to 1. These compression ratios will appear the more unusual when it is remembered that the engine is of the L head type, which, as experiment seems to have proved, does not stand as high a compression as the valve-in-head type.

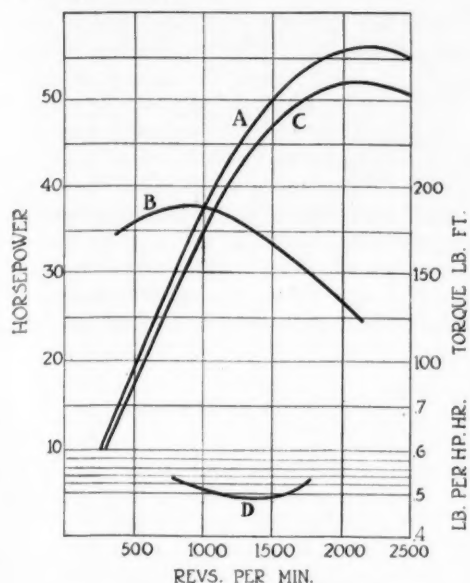
To make this high compression practicable, great pains were taken in the design of the combustion chamber to avoid the creation of hot spots. In fact, the hot spot is eliminated even in the manifold, and, as may be seen from the side view of the engine herewith, the inlet manifold is entirely separate from the exhaust manifold. Provision is made for preheating the air entering the carburetor in a muff surrounding the exhaust manifold, but that is all the heat artificially supplied to the mixture before it enters the cylinders. One might expect distribution difficulties without heat to the manifold walls, but from the high fuel economy figures obtained, one can only draw the conclusion that the distribution is excellent.

The comparatively small diameter of the inlet manifold and the resulting high air speed and energetic atomization probably account for this.

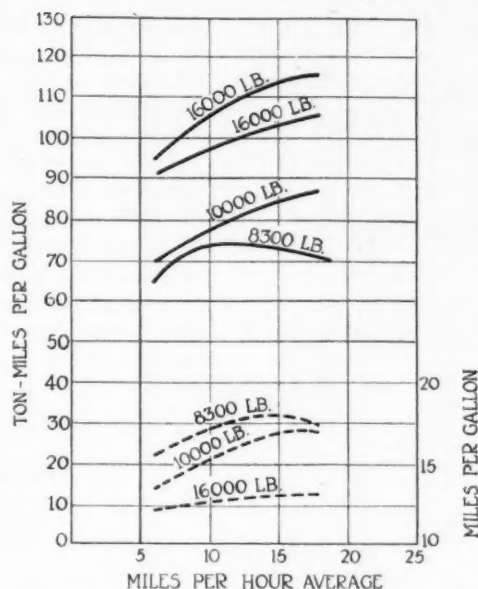
H. L. Horning, general manager of the Waukesha Motor Co., has long been an advocate of turbulence, and he has shown his faith in this principle by adopting for the new engine a modified form of the Ricardo combustion head. Over the greater part of the cylinder section the piston head comes up close to the cylinder head when the crank is in the top dead center position, much of the compression space being directly over the valves. It is obvious that with a compression space of this form there is a great rush of gases just prior to the instant when the piston reaches the end of the compression stroke, across the compression chamber in the direction toward the valves, and hence great turbulence. In some of the first experimental engines the



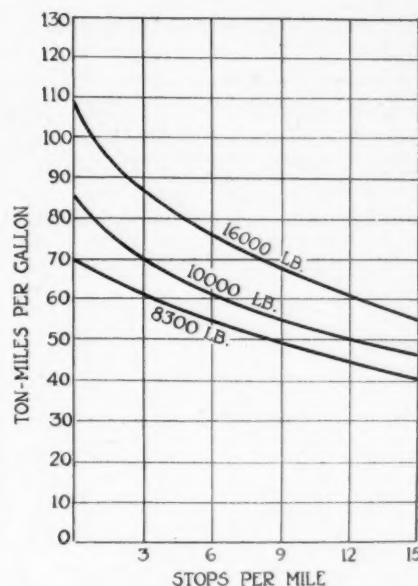
Valve side of Waukesha model FU engine. Connecting rod with radiated bearings



Horsepower and torque curves with "maximum power" mixture (A and B) and horsepower and fuel consumption curves with maximum economy mixture (C and D)



Bus economy curves for inter-city operation



Bus economy curves for city operation with frequent stops

spark plugs were placed in the inclined portion of the cylinder head, but it was found that better results could be had with the plugs almost directly over the valves, as shown in the sectional view.

The pistons are of aluminum alloy and are designed to insure rapid flow of the heat imparted to them by the burning gases, to the cylinder walls. Two double rings are used on each piston, each set of two rings in a single groove. The rings are pinned, so it is impossible for the gaps in both of the rings to come in line. The piston pins are clamped in the upper end of the connecting rods and have their bearings directly on the aluminum of the pistons.

The valves are made of Silchrome, an alloy capable of withstanding high working temperatures, but to insure further against valve troubles the Pabst valve rotator has been adopted which, in this particular design, causes the valve to turn completely around on its seat once for every 100 revolutions of the crankshaft. A description and an illustration of this valve rotator are given on page 1273 of this issue. To insure effective lubrication of the valve stems, holes are drilled in the horizontal wall over the camshaft which separates the crankcase from the valve chamber—one for each cylinder. Owing to the unequal instantaneous speeds of the two pairs of pistons, a sort of pumping action is produced which throws a stream of oil into the valve chamber and keeps the valve stems thoroughly lubricated, it is claimed.

Connecting Rod Design

There is nothing out of the ordinary in the connecting rod and crankshaft design. The connecting rod is of substantially uniform section throughout the major part of its length, but the section widens upon approaching the bearings. At the lower end the co-called radiated bearings are used, which are provided with deep flanges with corrugated outer surfaces which permit increased heat radiation. As may be seen from the sectional view, the crankshaft is of very sturdy proportions, the diameter being substantially $2\frac{1}{4}$ in. Lubrication is by the hollow crankshaft system and the oil consumption is claimed to be very low.

A block test of one of these engines was made on Dec. 13, in the presence of the writer, in the laboratory of

the Waukesha Motor Co. The engine, fitted with a Stromberg carburetor and connected to an electric dynamometer, was run at various speeds under full open throttle and readings were taken of the average torque and the total number of revolutions made while the engine consumed one pound of gasoline. The gasoline tank was located on a scale which was provided with an electric contact device arranged to light up a signal lamp when the weight of the fuel came down to a certain point. At that instant the revolution counter was set going and observations of the torque were begun. The moving weight on the scale beam was then slid along to a point denoting one pound less than that indicated in the first instance, and when one pound of gasoline was consumed the signal lamp would light up again, whereupon the speed counter was stopped by means of an electric switch. The air entering the carburetor in this test was not preheated and the engine was cooled by means of the regular radiator with a fan behind it.

The electric dynamometer having a torque arm $15\frac{3}{4}$ in. long, the formula for the torque is

$$\text{Torque} = \frac{\text{Scale reading} \times 15\frac{3}{4}}{12} \text{ lb.-ft.}$$

The formula for the horsepower is

$$\text{Horsepower} = \frac{\text{Scale reading} \times \text{R.P.M.}}{4,000}$$

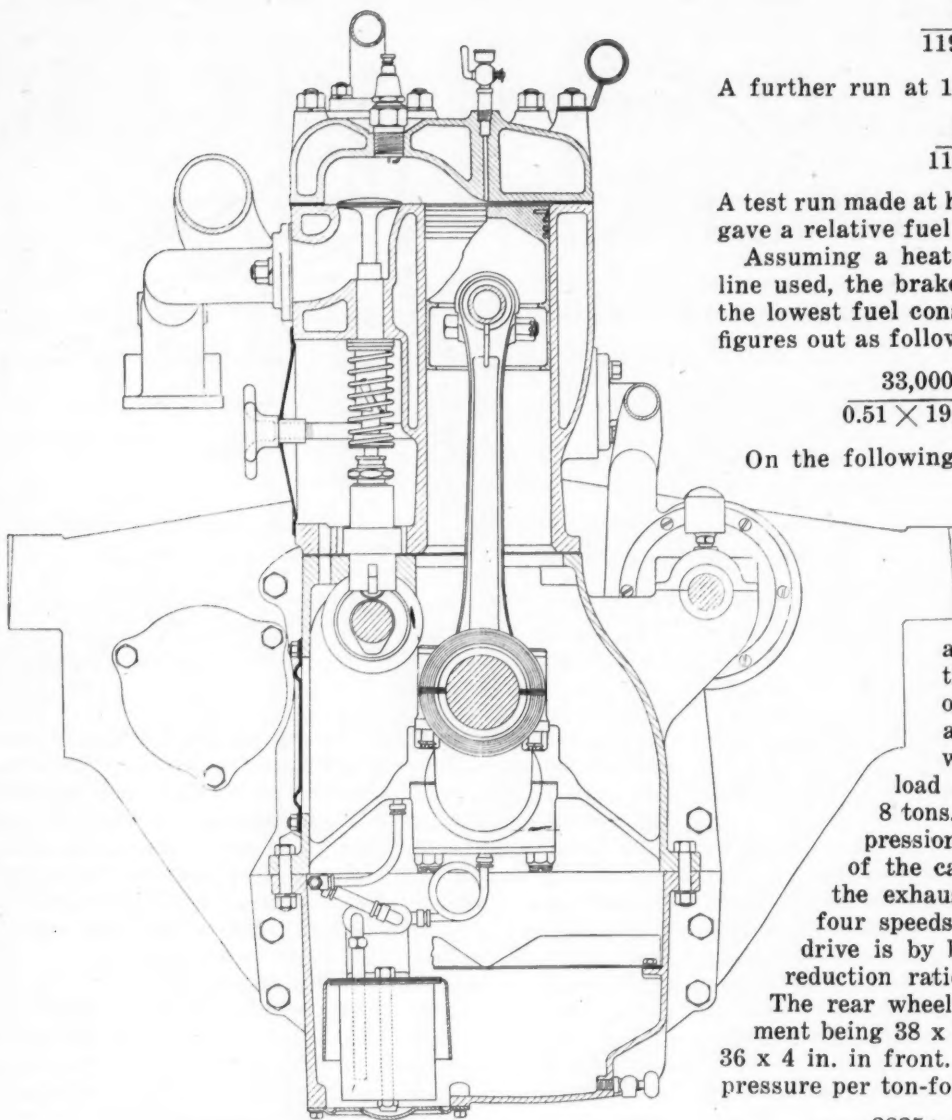
and the formula for fuel economy or relative consumption is

$$\text{Fuel economy} = \frac{240,000}{\text{Scale reading} \times \text{total revs.}} \text{ lb. p.h.p.-h.}$$

Following are the results of the first test run: Total revolutions, 3614; mean pressure on torque arm, 128.5 lb.; duration of run, 3.59 min.; speed, 1007 r.p.m. The gasoline economy for this run figures out as follows:

$$\frac{240,000}{128.5 \times 3614} = 0.517 \text{ lb. p.h.p.-h.}$$

The question came up as to whether a correction factor should be applied to this result, the same as is done in making tests for maximum horsepower. While some of the later tests were made, during the



Sectional view of engine

evening, the temperature in the testing laboratory was far above the standard testing temperature and the barometer was low (snow falling). Both a high temperature and a low barometric pressure affect the maximum output of an engine adversely, and for this reason a correction factor of several per cent would have been applied had a horsepower determination been made, to allow for the reduced density of the atmosphere. There is little doubt that, since some of the losses in the engine, such as that due to the shearing of the film of oil on the cylinder walls during the idle strokes, are of constant value, the efficiency of the engine also decreases slightly with decreasing atmospheric density. Evidently, however, the decrease in thermal efficiency is not nearly as rapid as that of the density of the atmosphere and it was therefore decided to refrain from applying any correction factor.

In the second run at a somewhat higher speed the engine made a total of 3684 revolutions on one pound of gasoline, with an average brake beam reading of 125.25 lb. The fuel consumption in this case therefore was at the rate of

$$\frac{240,000}{125.25 \times 3684} = 0.52 \text{ lb. at 1155 r.p.m.}$$

The third run was made at a still higher speed (1400 r.p.m.) and gave the following result:

$$\frac{240,000}{119.5 \times 3934} = 0.51 \text{ lb.}$$

A further run at 1425 r.p.m. gave

$$\frac{240,000}{115 \times 4036} = 0.517 \text{ lb.}$$

A test run made at half load (60 lb. brake beam pressure) gave a relative fuel consumption of 0.715 lb. p.hp.-h.

Assuming a heat value of 19,000 B.t.u. for the gasoline used, the brake thermal efficiency corresponding to the lowest fuel consumption recorded in the above tests figures out as follows:

$$\frac{33,000 \times 60}{0.51 \times 19,000 \times 778} = 26.2 \text{ per cent.}$$

On the following day a test run was made with the

motor truck or bus above referred to, which has been fitted with one of these engines. The machine was originally a 2½-ton Sterling truck, but was fitted with a closed body to present the same wind resistance area (39.6 sq. ft.) as a motor bus, and the rear axle is geared to make the operating conditions similar to those of a bus in interurban service. The truck was loaded with iron castings to a total load (truck, dead load and passengers) of 8 tons. The engine of this truck has a compression ratio of 4.56 to 1 and the air intake of the carburetor connects to an air stove on the exhaust manifold. The transmission gives four speeds ahead and one reverse and the final drive is by bevel and internal gears, with a total reduction ratio on the direct drive of 6-1/6 to 1. The rear wheel diameter is 38 in., the entire equipment being 38 x 7 in. single solid tires in the rear and 36 x 4 in. in front. The piston displacement under gas pressure per ton-foot is therefore

$$\frac{3825 \times 6 \frac{1}{6} \times 289}{16,000 \times 38} = 11.2 \text{ cu. in.}$$

This truck is fitted with the Rushmore steam cooling system whereby the engine jackets are kept at a uniform temperature above 212 deg.

A considerable amount of snow had fallen during the night and it was found impossible to get out of the factory yard without chains on the wheels. A pair of chains was therefore procured and the test made with these on the rear wheels. The fuel system was drained and a supply of Red Crown gasoline of 57 deg. Baume was obtained and poured into a small diameter, vertical, cylindrical tank, with gage glass, at the side of the cab. This tank was calibrated by means of a gallon measure, and it was found that the addition of one gallon to the supply of fuel in the tank raised the level within it by 6 3/16 in. Hence the fuel consumption could be determined by measuring the drop in the level during the run.

Gasoline Consumption Test

The test run was made over concrete roads in the vicinity of Waukesha with about 5 in. of loose snow on the ground and snow falling. At the completion of the run the odometer, which was driven from the propeller shaft, registered 15.65 miles and measurement showed the fuel level in the tank to have dropped 12½ in. Hence the fuel consumption was $12\frac{1}{2} / 6 \frac{3}{16} = 2.02$ gallons and the rate of fuel consumption, $(8 \times 15.65) / 2.02 = 62$ ton-miles per gallon.

In tests under more favorable conditions Horning claims to have obtained the results shown in the accompanying graph. The weights inscribed on the different curves denote the total weights moved in each case. All of these tests were made without stop, or at least without voluntary stops. In regular bus service, of course, frequent stops have to be made, as a rule, and this will pull down the fuel economy. To determine the effect of stops on the relative fuel consumption Horning made another series of test runs during which stops were made at regular intervals, and the set of curves shown in another figure was obtained.

This fuel economy is, of course, far beyond what is being obtained to-day in motor truck operation. It is the result of careful development work in connection with engines and of the considerably more favorable conditions in motor bus operation. These buses go over established routes, for the most part with good pavements and moderate grades, and the gear ratio can therefore be held low. High engine compression and high jacket temperatures are the factors that make for economy, but they are limited by the tendency of the engine to knock. It should be pointed out that in the test described there was absolutely no indication of knocking.

Valve Rotator for Poppet Valve Engines

THE Pabst valve rotator is a device designed to give the poppet valves of internal combustion engines a slight rotary motion at every lift or, rather, descent. The reason for wanting the valve to rotate is that in operation the valve head does not heat up uniformly. In an L head engine that portion of the head toward the cylinder will assume a higher temperature than the rest, and this is likely to cause warping. If the valve is rotated and different portions of the head are exposed successively to the higher temperature of the cylinder side, the temperature of the whole valve head will be materially lower than that of the hottest portion when the valve is not rotated, and the tendency to scoring and pitting is therefore greatly reduced if not eliminated. It is claimed, moreover, that in passenger car engines trouble with the valves is due chiefly to carbon getting onto the seats, and that the rotation of the valves also overcomes this trouble.

Referring to the sectional view, the valve rotator comprises a base member which forms a valve spring washer and a ball bearing at the same time. The cupped member A of the ball bearing has a tubular extension which at its upper end is provided with radial arms engaging into helical slots in what is known as the spiral member B. This spiral member is virtually a sleeve surrounding the lower portion of the valve guide. At its upper end it tapers out, forming the male member of a small cone clutch. It is also counter-bored to receive the clutch spring C, which is held in position by the soft steel washer D pressed into the spiral member. Against the female member E of the clutch the upper end of the valve spring bears.

When the valve is lifted, the pressure of the valve stem key F on the base member and the corresponding pressure of the radial arms on the walls of the helical slot in the spiral member, causes the cone clutch to disengage and allows the spiral member B to rotate slightly, in conformity with the valve lift and the spiral angle of the slots. When the valve descends, the clutch engages, and as the female member E of the clutch is

held from rotating by being firmly pressed against the cylinder block by the valve spring, the spiral member is now held from rotating, consequently the radial arms on the base member, and with them the base member and the valve itself, are compelled to follow the helical path determined by the slots in the spiral member. Thus the valve has a rotating motion only during its descent and moves upward without rotating during the lift.

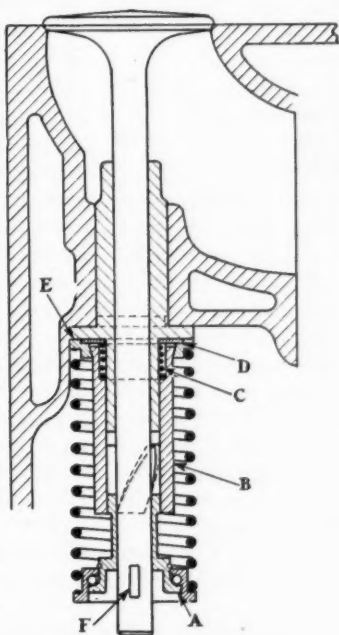
The manufacturers, the Pabst Corp., claim that the use of valve rotators enables an engine to give more power, because it ensures continued gas-tightness of the valves, and they also claim that the wear on the valves is reduced.

Westinghouse Developments in 1922 Reviewed

AN annual review of the engineering achievements of the Westinghouse Electric & Mfg. Co., recently issued, contains several items of interest to the automotive industry. During the past year the company has commercialized its $\frac{3}{4}$ -kw. and $1\frac{1}{2}$ -kw. farm lighting sets and they are now in production. A number of improvements were made in connection with the company's lighting, starting and ignition outfits, of which the following are examples: A pedal-operated pinion shift for engaging the starting motor pinion with the flywheel gear which has incorporated in it a slip clutch to take care of back fire, and an over-running clutch to relieve the starting motor when the engine fires and picks up; a new foot-operated starting switch, the perfection of the lubrication of sleeve bearings on automobile generators, a new type of voltage regulator for use with the generator for charging storage batteries, a new ignition and a new lighting and ignition switch.

Among apparatus not classed as automotive but which finds amplification in the development of automotive electrical equipment, is an oscillograph which is mounted in a box measuring 11 by $11\frac{1}{2}$ by 25 in. and weighing 80 lb. The driving motor and film holder weigh about 20 lb. and are carried separately. The complete oscillograph may be taken as baggage on a taxicab or in a Pullman car. Following are the main features of the new instrument:

An improved optical system and lamp control make it possible to use a special incandescent lamp and obtain good results. The day-light loading film holder makes it possible to take as many oscillations as desired without having access to a dark room. The instrument is said to be simple to operate and is designed to be used on either 110 or 220 volt, 25 to 70 cycles, or from a 6-volt storage battery circuit.



Sectional view of Pabst
valve rotator

Just Among Ourselves

Fisher Body Advance Perturbs Wall Street

WALL STREET and certain financial interests are very much perturbed about the sensational advance in the price of Fisher Body stock and there are rumors of a "corner" of the available supply. General Motors owns 300,000 of the 500,000 no par common shares of Fisher Body and has a contract with its subsidiary, which still has several years to run, providing for the construction of bodies on a cost plus basis. The present situation results from the fact that there is a stipulation in the contract under which the stock not controlled by General Motors cannot be sold without the consent of the holders of 95 per cent of the two-fifths. It is understood that W. C. Durant and his associates control more than five per cent of this two-fifths and that it will be sold to the partners in the Durant enterprises.

Dollar Value Not Likely To Increase Next Year

WE frequently are asked our views on the outlook for 1923 business and just as frequently admit frankly that we have no prophetic vision. There are certain signs and portents which cannot be ignored but most of them relate to general business. The first quarter unquestionably will be much better than it was this year and the second quarter undoubtedly will be fully as good. This will provide six months of splendid business. It would be foolhardy to try to lift aside the veil and peer into the last six months of the coming year. With Ford planning greatly increased production, with the Star coming into the market, with Chevrolet preparing to turn out 2000 a day and with other low priced cars in increasing demand, it will be strange if there are not as many passenger cars sold as there were

this year, but we don't believe the dollar value of the total sales will be any larger than in 1922 if as large. It will be only about \$300,000,000 larger this year than in 1921, with about 850,000 more vehicles.

Fifth Avenue Unveils Bronze Traffic Tower

WITH rather impressive ceremony, the first of the dignified and really ornamental bronze traffic towers which will supplant the experimental structures in Fifth Avenue, was unveiled the other day at the intersection of Forty-second Street. These towers will be the gift of the Fifth Avenue Association. The wooden structures they will replace were erected at his own expense by Dr. John A. Harriss, the special deputy police commissioner whose hobby is the solution of traffic problems. The same system, which governs traffic for several blocks and which has done much to relieve the fearful congestion on the Avenue, will be continued. Mayor Hylan and Dr. Harriss made speeches at the unveiling. The police band played "Auld Lang Syne" when the old tower was hauled away and the "Star Spangled Banner" when the new one was uncovered.

What Is Best Time To Hold the Shows?

THE old question about what is the most advantageous time of year to hold shows, from the viewpoint of trade stimulation, has been revived and is agitating the members of the N. A. C. C. There are arguments in favor of fall shows and also of winter expositions. If the shows are to be made primarily a display of new models, then the early fall is the time to hold them unless the industry changes its practice in relation to new jobs. If, on the other hand, they are designed to

break the winter selling ice and arouse the interest of prospective spring buyers, it would seem that they are now timed about right. It all depends on what is to be the main purpose of the expositions. Judging from the business this year and with the demand for closed models so keen, fall sales need no particular stimulation. The supply of closed jobs hasn't been equal to demand.

Another Evidence of Trading Discount Evil

A NEW ROCHELLE dealer who handles five non-competing lines, advertises in a local newspaper that he will allow \$500 "on any automobile that runs" in exchange for a new — up to Jan. 1. It is hard to believe that this man would make such a proposition unless the factory is making him a liberal "trading discount." This is one way in which a factory can hold back the wheels of progress in solving the used car problem. It may increase production for the time being but it doesn't build solid prosperity.

Ford Two-Ton Trucks Interest Industry

REPORTS that Ford is about ready to bring out a 2-ton truck appear to be pretty well founded. There is no definite information as to when it will make its appearance or the price, but the truck industry is mightily interested. If Ford makes them it's certain he'll sell a lot of them. Thus another monkey wrench will be thrown into the truck merchandising machinery. Commercial vehicle manufacturers who are members of the National Automobile Chamber of Commerce will have plenty of things to talk about when they get together in New York show week. It is hoped some constructive action will be taken. When all are agreed that there are many serious problems to be

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

solved it ought not to be impossible to find some common ground upon which to stand in trying to work out answers.

Durant Likely to Add Another Car to Line

THERE probably is considerable basis for recent assertions that another old and favorably known passenger car line, at present in limited production, soon will come under the control of W. C. Durant. As the situation stands today he has nothing between the Durant six, which sells now for \$1650 in the 5-passenger touring model, and the Locomobile which is now priced at \$7600. The price of the car which he is said to seek is \$3750. The new 6-cylinder Flint which Durant is bringing out and which will be displayed at the New York show, will sell for a little less than \$1200. The designs have not been completed but they will include some of the features of what was to be known as the Chrysler six. It is understood that in body lines and in some other respects it will resemble the Locomobile.

Not Much Speculation About Price Changes

AT this time last year the industry was speculating avidly on what price changes were likely to be announced at the New York and Chicago shows. It is significant of changed conditions that this year there is little discussion of this subject. Everyone realizes that prices are pretty well stabilized. They can't go much lower and they're not likely to go much higher, notwithstanding increased production costs. If prosperity lags in any industry next year it probably will be due more than anything else to inflation of prices. "Beware a Buyer's Strike" should be a motto on the wall in the office of every executive. Deflation follows inflation just as

regularly as day follows night, although not quite so rapidly, and general deflation always brings depression in its wake. The depression lasts until the public reacquires the buying habit.

Industry Retains Sanity on Plant Expansions

WHILE a good many companies in the passenger car field are talking about doubling their production next year, it is gratifying to note that few of them contemplate plant expansion. There are mighty few concerns which can afford to take the chance. We often have pointed out that there is enough production capacity in the country to meet the demand for motor vehicles for a long time to come. It is true that the ability to produce is not ideally distributed but it is there none the less. A few factories are too small but there are many more which are too large. Much of the travail of spirit which followed the industrial collapse in 1920 could have been avoided if the cash which went into factory extensions had been left in the bank. There wouldn't have been so many reorganizations and re-financings.

Other States to Be Told of "New Jersey Plan"

ALFRED REEVES, who seldom overlooks a bet when the good of the industry is concerned, is helping to make New Jersey famous, although he lives in Yonkers. The provisions of the successful \$40,000,000 highway bond issue referendum has been christened by him "the New Jersey plan" and all the other States will be told about it. The plan will put into effect the highway platform of the automotive industry which has been that the construction cost of highways should be levied against abutting property owners and society as a whole while main-

tenance costs should be paid by motor vehicle users. Efforts to promote this scientific system for the building and up-keep of highways probably will be more effective now that it has been adopted by a progressive State.

Durant to Tell Story of Split with G. M. C.

PART of the "inside story" of how W. C. Durant came to retire as head of the General Motors Corp. will be given the public in a magazine article which will be published in a week or so. All the financial details will come out sooner or later. Part of them are familiar to most of the men in the industry. There is a fascinating financial romance in the story of how Durant's personal fortune was engulfed in his effort to bolster up the price of General Motors common. His friends also assert that he protested vigorously against the program of expansion which was entered upon by General Motors just before the depression began in 1920, including the erection of the huge General Motors building in Detroit.

Traction Company Men Are Studying Buses

WHEN superintendents of traction companies are taking time off to go out and study the practical operation of buses by electric railroad interests, it indicates that they are thinking along new lines. We found one up-State the other day who works for a company which operates lines in several cities, who admitted frankly that he had been making a special study of the situation and that his people were prepared to put buses at work as soon as it had been demonstrated that the demand for them was strong enough to insure profitable operation. His inquiry was confined to Ohio and he was visibly impressed by what he had learned. J. D.

A Critical Study of Modern Steering System Design

Part II.

Causes of wheel wobble held to be unstable equilibrium of wheels, faulty drag link arrangement and lack of balance. Certain degree of reversibility in steering gear considered desirable. Reductions in steering gear mechanisms vary from 6 to 1 to about 10 to 1.

By Herbert Chase

AMONG the commonest faults of the steering system and one whose causes are least understood, is that of wheel wobble, by which is meant the periodic oscillation in angular position of the wheel and axle spindle about the knuckle pivot which results in the wheel following a course that deviates alternately to the right and left of a straight line. When this phenomenon occurs, as it often does in step with the natural period of the springs and front end of the chassis, the latter is given a violent transverse motion or shake popularly termed "shimmying."

If the front wheels of a vehicle were in equilibrium with respect to the knuckle pivot in all angular positions of their spindles when the vehicle is in motion, wobble would seldom occur providing the layout of the drag link and the spring is correct. But when the knuckle pivots are inclined either in a transverse or longitudinal plane the wheels are in equilibrium in only one position and if deflected from that position they tend to swing back to and past it, oscillating in pendulum fashion unless the motion is damped out by friction. Consequently any chassis in which the knuckle pivot is tilted has at least an incipient tendency to wheel wobble.

Another primary cause of wheel wobble is faulty layout of the drag link in reference to the spring. If the drag link is of rigid construction or substantially so and if the steering gear arm is held rigidly, the end of the link attached to the knuckle arm will swing through an arc when the front springs are deflected from their normal position. The axle center is constrained, under the same condition, to move in a path which approximates an arc whose center is the eye in the unshackled end of the spring. These arcs seldom coincide exactly, consequently the ball on the knuckle arm is given some motion in respect to the axle center and, since it is constrained to move about the knuckle axis it causes the knuckle, the wheel spindle and the wheel to oscillate.

This is seemingly a self-evident fact, yet it is frequently overlooked or else the compromise chosen leaves much to be desired for severe wheel wobble is often caused by failure to adequately consider this detail. Cases have been known in which trucks have even suffered from broken frames or continually loosening engines and other parts due to a faulty layout in this regard.

Wheels or tires which are out of true or out of balance will also cause wobble.

The three primary causes of wobble thus appear to be:

1—Unstable equilibrium of wheels carried on knuckles with inclined pivots.

2—Faulty layout of drag link in reference to springs.

3—Lack of balance or failure of wheel to run true.

There are, in addition, a considerable number of factors which add to or help set up wheel wobble or render it more severe when once it is started. We shall not attempt to deal with all of these in detail, but will mention some which have been brought to our notice.

Friction tends to damp out wobble just as it does any other mechanical oscillation. Conversely, wobble when it occurs, is certain to be more pronounced when friction is at a minimum. This is why vehicles with loose or very free steering connections are more apt to be addicted to wobble than those with joints set up tight. Thus wobble can often be stopped by tightening all steering connections—a rough sort of remedy which if not used with discretion can result in excessive friction and rapid wear of parts.

The greater friction caused by under-inflated tires or increased weight on wheels can easily damp out wobble, while such items as anti-friction bearings on knuckle pivots, better lubrication, loose treaded tires and the like sometimes make wobble worse. This should not, however, be used as an argument against minimized friction in the steering system for it is certainly possible to have free steering without wobble.

THIS is the concluding part of a paper to be presented at the Annual Meeting of the Society of Automotive Engineers on Jan. 10, 1923. It is printed here in advance with a view to encouraging discussion at the meeting.

Among the subjects treated in this section is that of wheel wobble. An effort has been made to summarize here the various views expressed recently in these columns in reference to this phenomenon, its causes and cure—matters which have attracted wide attention among engineers here and abroad.

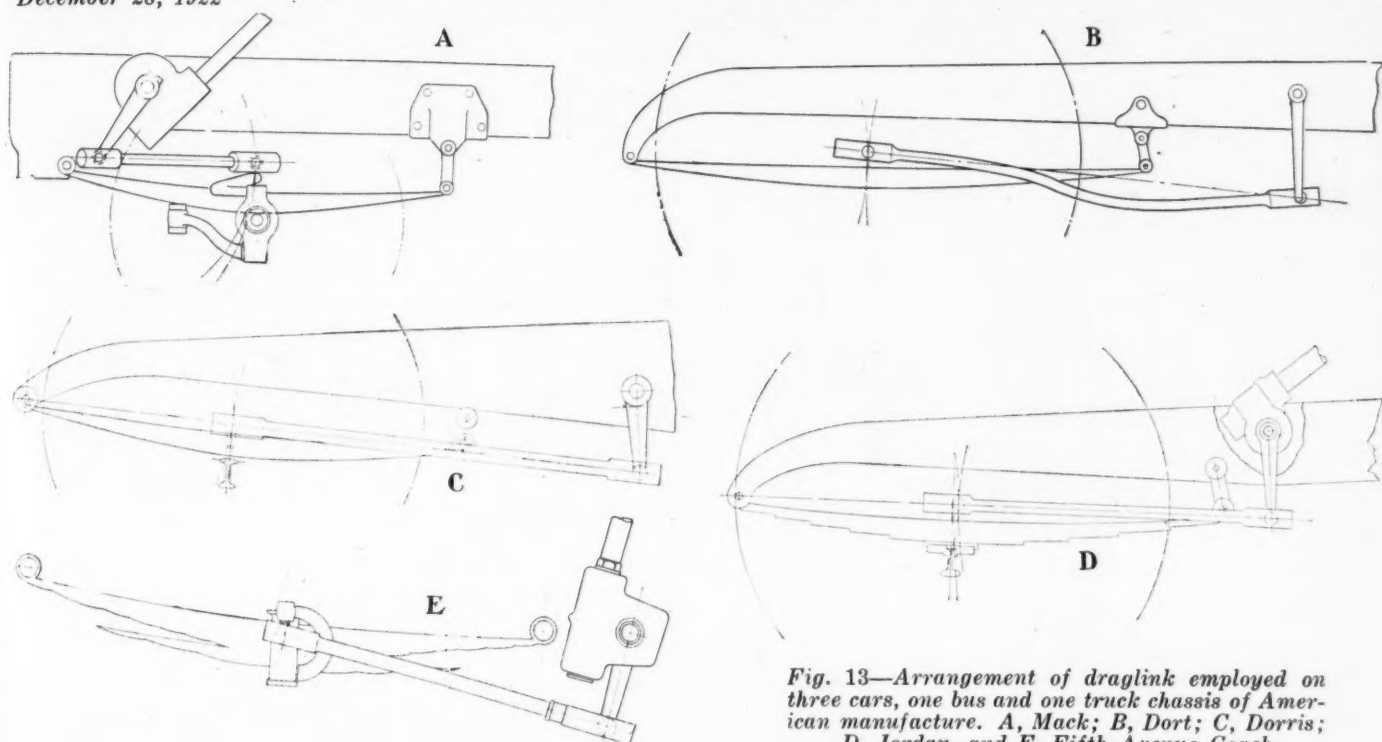


Fig. 13—Arrangement of draglink employed on three cars, one bus and one truck chassis of American manufacture. A, Mack; B, Dort; C, Dorris; D, Jordan, and E, Fifth Avenue Coach

It is quite conceivable that wobble so slight as to be imperceptible to the operator can occur especially if the steering gear approximates the so-called irreversible type. It is clear also that any slackness or insufficient stiffness in any part of the steering system or its support, springs and spring parts included, which permits the wobble to take place through a greater amplitude than it otherwise would do, is apt to make the wobble more violent. Thus a weak axle, frame or steering gear housing or insecure fastening of these members will sometimes permit of wobble which would not otherwise become apparent. Much the same can be said of drag links, tie rods, tie rod and knuckle arms and steering gear parts, which are not stiff. Similarly, front springs which are weak or loosely fastened can help to amplify wobble and weak springs in the drag link will do likewise as will also a whipping action of either drag link or tie rod.

Shake of Front End

From the foregoing it will, we believe, be easy to see how wheel wobble occurs. It is not so easy to explain why violent shake of the whole front end of the vehicle, which involves very heavy forces, sometimes results. To help clear up this point, consider the following:

Suppose the wheel is wobbling, due to any of the causes enumerated, and is about to complete one deviation, say to the right. Now suppose that each time it reaches this position it strikes a road inequality which tends to accelerate its angular motion in the same direction, that is, an impulse in step with its natural period. It will swing still further to the right, fetch up short and be snapped back to the left, perhaps again receiving a blow from the road which accelerates it in that direction. Again it fetches up and is again snapped back, building up a cumulative effect which can even become so violent as to put the car out of control.

It is possible also that a physiological reaction from the arms of the driver can under some conditions act as the force which accentuates wobble. In any case, it sometimes happens that a car which is "shimmying" badly will cease to do so immediately if the driver releases his grip upon the steering wheel.

The freer the swing and the greater the play in the

linkage, the less damping out there is and the more violent the shocks imposed in fetching up in extreme positions.

The front end of the frame, the engine, radiator, etc., of course, tend to follow the right and left oscillation of the wheels and if the period is in tune with the natural period of the mass involved, the shake becomes exceedingly violent.

There are doubtless some gyroscopic forces involved in this wobble phenomenon. In this connection one commentator states that up and down motion of the spindle tends to induce a wobble of the wheel about an axis at right angles to the spindle. Another points out that a revolving wheel tends to resist deflection from its plane of rotation, but once such deflection is started only a small force will keep it oscillating.

The amplitude of wheel wobble caused by lack of a perfect tie rod and spring layout depends in part, at least, upon the length of the lever arms involved. It is desirable to have the knuckle arm connected to the drag link as long as possible and still clear the spring providing, of course, it is made sufficiently stiff, for the longer this arm is, the less will a given motion of its ball end affect the course of the wheel. A long drag link also has the advantage of swinging in an arc of less curvature than a shot link.

Drag Link Location

It is customary for steering gear makers to advise their customers to so locate the gear that the ball on the gear arm, that on the knuckle arm and the pin on the unshackled end of the spring are in the same plane, (or in line as viewed in side elevation) when the vehicle is under normal load. This brings the drag link approximately in line with the main leaf of the spring. Others contend that a somewhat different layout is better. It is agreed, however, that the best layout is that which causes least motion of the wheel spindle about the knuckle pivot when the axle is moved under influence of spring action. At best the layout is a compromise which requires careful study if ill effects are to be minimized. A number of layouts employed on modern passenger car and truck chassis are shown in Fig. 13.

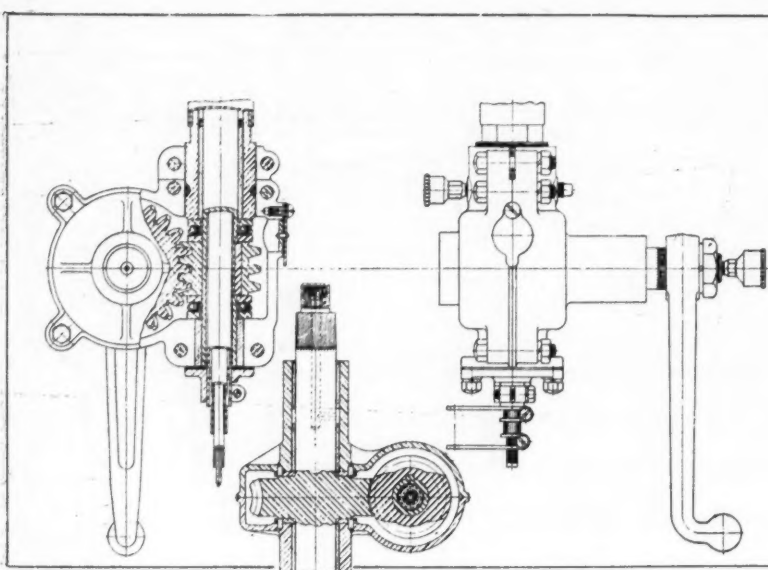


Fig. 14—Gemmer worm and wheel type steering gear

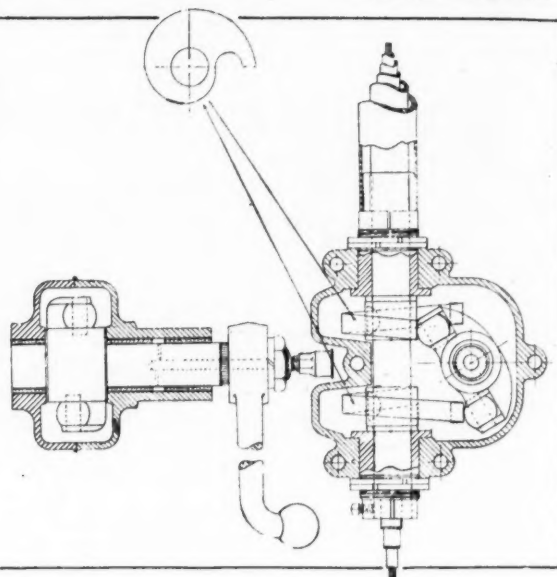


Fig. 17—Ditweiler (Marles) cam type steering gear

There are some advocates of a transverse as opposed to a fore and aft arrangement of the drag link. One of these contends that it avoids the use of a crooked drag link and in most cases gives a better layout, especially when maximum wheel cramp angles are considered. Another engineer takes the view that a cross type drag link is not satisfactory with the usual spring suspension, a contention which he says is readily borne out by studying the layout on the drafting board. This may well be true in some instances, but it is evident that each case must be considered on its merits and the best compromises selected.

On some short wheelbase passenger cars and on trucks in which the driver's seat is well forward, a transverse drag link arrangement is often quite satisfactory. The frame must, however, be designed to withstand the twisting stresses which such a layout will sometimes impose.

Irreversibility

There is much loose talk to be heard concerning the so-called irreversible steering gear, but, so far as the writer is aware, there is no such thing used as a completely irreversible steering gear, nor does it seem desirable to employ such a construction even though it should prove feasible to produce it.

Perhaps the closest approach to an irreversible gear is the worm and wheel, or worm and segment type. With this type the wheels can be moved by applying a steady side pressure on the wheel, proving that it is not irreversible, but a sudden shock tending to deflect the wheels from a given position has a tendency to cause such a gear to become momentarily irreversible or self-locking. This is probably due to the fact that the lubricant is momentarily forced from between the relatively small contact surfaces of worm and wheel, thus increasing friction and preventing the turning which would otherwise occur. On this account a gear of this type is practically irreversible under shock, which is precisely the condition under which irreversibility is held by some to be desirable.

So far as we are aware all other types of gears are more readily reversible than the worm and wheel type and are, therefore, for the same reduction ratio and steering system layout more apt to permit any shock tending to deflect the road wheels to be transmitted to the steering wheel.

Some engineers take the view that it is not desirable to have the steering gear approach closely the self-locking condition, for the reason that when so made the linkage and bearings between the steering gear and the wheels are more heavily stressed when shocks are imposed. When the gear is free enough to transmit the motion caused by the shock to the steering wheel some of the energy of the shock is dissipated in the mechanism of the gear, thus bringing about a certain cushioning action which is advantageous. If, however, the motion on the steering wheel becomes excessive it is much less comfortably handled by the operator.

Those who favor the comparatively easily reversed type of gear are apt to favor also a center point steering arrangement which, as pointed out elsewhere, tends to eliminate shocks in the plane of the wheel, the kind of shock most frequently encountered.

All things considered it is probable that a certain degree of reversibility is a desirable thing, but it is certainly not desirable to employ gears which are so easily reversible as are used in some present-day cars.

Comparison of Steering Gear Types

The following types of steering gears are in more or less general use today:

- a—Worm wheel and worm and segment.
- b—Screw and nut, including differential nut types.
- c—Bevel gear.
- d—Planetary gear.
- e—Spur gear and rack.
- f—Cam type.

It is impossible to consider here all of the advantages and disadvantages of the various types, especially since it is not always easy to differentiate between advantages inherent in the type and those which are chiefly dependent upon the particular embodiment of the type.

The worm and wheel and the worm and segment type appear to have a certain advantage in respect to their tendency to become irreversible under shock—a tendency not common to other types. This characteristic is discussed elsewhere under the head of irreversibility.

When well proportioned and well lubricated the worm and wheel type has excellent wearing qualities, even though the bearing area between worm and wheel is rather small. If, however, lubrication fails, considerable friction and rapid wear are apt to result.

A disadvantage of this type is the fact that it is prac-

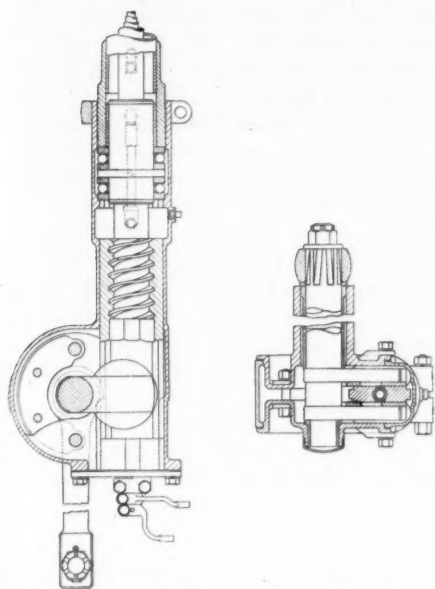


Fig. 15—Ross screw and nut type steering gear as used by Autocar

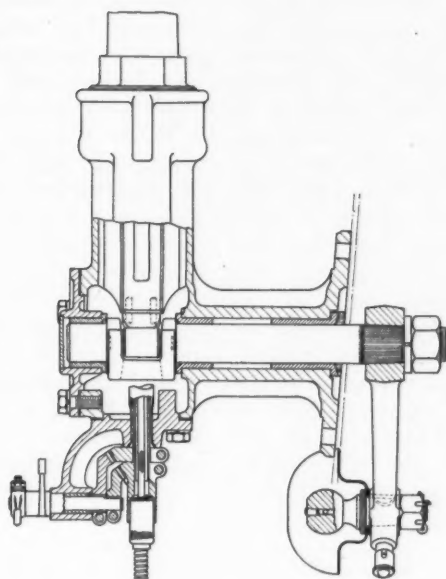
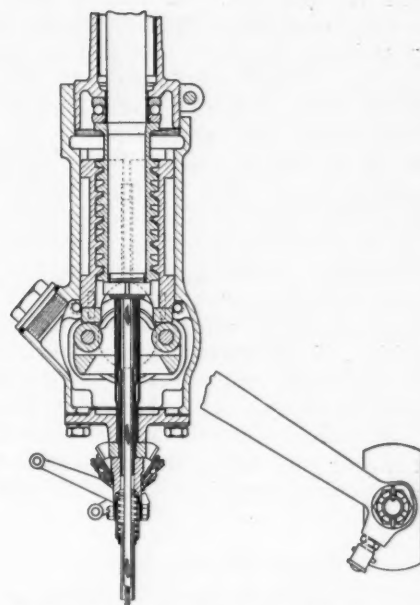


Fig. 16—Packard differential or screw and split nut type steering gear



tically impossible to take up any lost motion caused by wear, although, when the full wheel instead of a sector is employed, the wheel can be successively moved to four different positions 90 deg. apart, thus compensating for wear in the wheel, but not in the worm. It can be said, however, that well proportioned and well made gears of this type wear almost indefinitely provided they are kept well lubricated, so that the disadvantage cited can be made relatively unimportant.

Examples of the worm and wheel type of gear are shown in Figs. 4, 5 and 14.

Screw and Nut Type

One of the most widely used types of steering gear is the screw and nut type, which is generally regarded as being very satisfactory when well made. A good example of this type is the Ross gear, in the form used by Autocar, shown in Fig. 15.

The chief advantage of this type is good wearing quality due to the large bearing surface between the screw and nut and its chief disadvantages are its lack of adjustability and rather high cost of manufacture when the nut is well fitted to the worm. It can be said, however, that adjustment is seldom required, provided, again, that lubrication is properly cared for.

Alternative constructions of the same general type are used to overcome the disadvantage of non-adjustability just cited. In one of these the nut is made in two halves, one having a right and the other a left-hand thread, so that they move in opposite directions. This differential movement is transmitted to the steering lever shaft by a mechanism which can be easily adjusted to take up all lost motion. An example of this type of construction is the Packard gear shown in Fig. 16. In another make the right and left threads are cut on the inner and outer surfaces of a sleeve and the units or outer and inner mating parts are arranged to transmit their motion to a shaft on which the steering arm is carried by the use of a mechanism much the same as that shown in Fig. 16.

Types c, d and e are used only by a few manufacturers, chiefly on light cars where a large reduction is not required and where easy reversibility is not considered of much importance, or is outweighed by a relatively low cost of production. The latter is about the only advantage of these types unless their ability to operate after a

fashion without or with indifferent lubrication is regarded as an advantage. It is worthy of note, however, that some recent designs of American passenger cars intended for large production at a low price are equipped with the worm and wheel type of gear, so that any advantage of type c, d and e may have in respect to low production cost appears to be outweighed by their inherent disadvantages.

The only example of the cam type with which we are familiar is produced under Marles patents. The Ditweiler gear illustrated in Fig. 17 is of this type. It has yet to see any very wide commercial application, but has the advantage of simplicity and is said to have high mechanical efficiency. This type of gear has been designed to give its full motion either with one or with two complete revolutions of the steering wheel.

There is considerable difference of opinion as to the total reduction which is necessary or desirable in the steering gear. This reduction naturally depends to a great extent upon the weight of the car and the mechanical efficiency of the mechanism employed. The reduction ordinarily used on passenger cars varies from 6.0:1 to 9.66:1, and the number of revolutions of the wheel necessary to move the road wheels from locked to locked position varies from 1.5 to 2.25.

There are certain advocates of rather "fast" steering mechanisms, that is, mechanisms which require a relatively small angular motion of the steering wheel for a given angular motion of the road wheels. Others prefer a "slower" gear, or one with a greater reduction, even though this type does not respond as rapidly to the demands of the operator. Other things being equal, the slower the steering the less are shocks on the road wheels transmitted to the steering wheel and vice versa.

Tie-Rod Arms and Tie Rods

Tie-rod arms should be as stiff as weight and manufacturing considerations admit. If yoked tie-rod ends are to be employed it is important to see that the axes of the yoke pins are truly parallel to each other and to the knuckle pin axes, otherwise, if the yoke pin is well fitted, binding will occur in some positions. If the knuckle pivot axes are not intended to be parallel, as in the case of transversely raked pivots, it is necessary to use a ball joint or its equivalent between the ends of

the tie rod and the tie-rod arms to prevent binding.

One prominent designer states that it is practically impossible to fit yoked tie-rod pins tight enough to prevent rattle and still avoid binding. Even though the knuckle pivot and yoke pin axes are made truly parallel in machining, they are certain to be thrown somewhat out of this relative position when the axle is deflected, as it always is to some extent, under normal load. For this and other reasons a ball and socket joint such as is used on the ends of the drag link has certain important advantages. Some engineers consider it safer than the ordinary yoke construction. The springs back of the bearing blocks afford a cushioning action against shock which, if the springs are properly proportioned, is highly desirable. An unusual design of ball and socket tie-rod end is used in the Excelsior design, shown in Fig. 10.

A rather common and serious fault on some of the cheaper cars and trucks is the use of tie-rod yokes which are poorly fitted to begin with and which have a totally

inadequate means for locking them in position. The tangent bolt employed is frequently too small and the shank of the yoke is not split far enough or with a wide enough slot to insure secure locking. As a result the yoke soon rattles loose and becomes a source of danger.

When the tie-rod is of tubular section and especially when the walls of the tube are thin, care must be used to see that sufficient metal remains at the base of the thread to prevent failure under constant vibration. A yoke clamped to the tube by a tangent bolt sometimes compresses the tube under the influence of road shocks and the yoke loosens on this account. This fault has been remedied in some cases by the use of a tight fitting metal plug, somewhat longer than the threaded portion, forced into the ends of the tube.

There are some advantages in the use of a lock nut bearing against the inner end of the yoke shank instead of a tangent bolt, but close-fitting threads are very important in this case.

Two New Clutches Added to M. & E. Line

Have flexible driven member, direct acting springs and positively moved pressure plate. Easily adjusted for wear.

TWO new clutches are now being marketed by the Merchant & Evans Company of Philadelphia. These clutches are practically identical in design except that one of them is provided with a single plate, the other with a pair of plates and an additional driving member. Each model is made in 8, 10 and 12-in. size (torque capacity varying from 1500 to 3300 lb. in.). There are six springs acting direct on the pressure plate and giving a total pressure of 1200 lb. Disengagement is accomplished by three multiplying levers attached to the driven member and so proportioned that a throwout pressure of 125 lb. is required at the point of release.

As will be seen by reference to the accompanying cut the light driven element is formed from pressed metal with the friction facings riveted to the flange. At its inner diameter this plate is riveted to a flanged steel hub which is splined to the driven shaft. The driven disk is made flexible to compensate for any lack of alignment, while the heavy cast iron pressure plate tends to prevent chatter.

Double ended screws are fitted between the pressure plate and the throwout lever fulcrums so that the levers

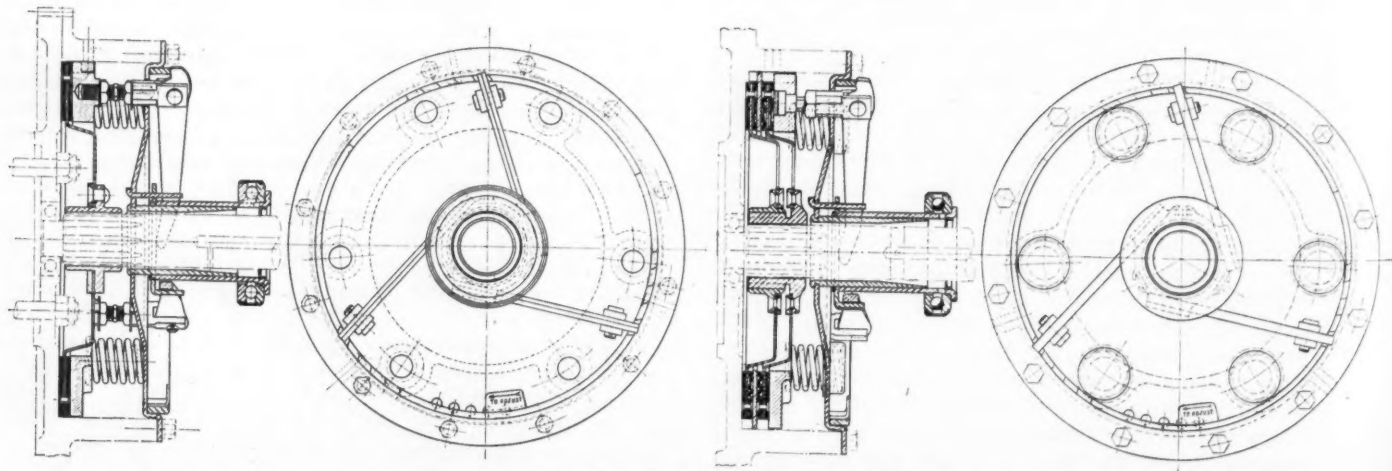
can each be adjusted exactly the same distance from the pressure plate thus preventing uneven working of the clutch and correcting for faults in machine work.

The arrangement of the pressure plate is such that it is positively released when the clutch is disengaged, thus tending to prevent drag. It is claimed that no clutch brake is required.

The release sleeve is so designed as to entirely clear the driven shaft, so that no lubrication is required between these two members. Only one ball throwout bearing is required as compared to two used in earlier clutches of the same make.

The clutch can be adjusted for wear by moving what may be termed a fulcrum ring upon which the outer ends of the disengaging levers bear. The bearing surfaces for the levers are arranged in steps of definite height so that circumferential motion of the ring changes the height of the bearing point for each lever the same amount, thus affording positive, fool proof and convenient means for effecting the adjustment.

Since the clutch forms a self contained unit it is easily assembled in the car.



New M. & E. single-plate and two-plate clutches

American Farmer Will Be Bigger Purchaser in 1923

He has been buying motor vehicles and will take farm equipment when convinced of price deflation. Implement dealers must drop antiquated customs and adopt automotive merchandising methods.

By Fred M. Loomis

THE American farmer is coming back to the market, at least as respects equipment for his farm. He is finding himself in much better position to buy than he thought he was.

A good deal of hocus-pocus has been said and written about the decline in the buying power of the farmer. Admittedly, on the basis of a comparison between the prices he received for his products during the war and what he gets to-day his buying ability has been sadly impaired. But even so, he is about 40 per cent better off than in pre-war days.

This is not an unsupported assumption. Those who have been in closest touch with the farmer and who have had the greatest personal interest in an interpretation of his condition assert confidently that his purchasing in the coming year will be much greater than it was last year. For instance, one of the best known and most influential of the farm papers says, under date of Nov. 17, 1922:

A study of crop and market conditions and of the volume and price movement would seem to effectually confirm this. The value on the farm of 12 leading crops at present is 5980 millions of dollars, according to deductions made from November report Department of Agriculture; same 12 crops with the estimated farm values one year ago 4705 millions. This notable difference, in producers' favor, is more than a billion and a quarter dollars.

It is the difference between then and now. Twelve months ago, a slough of despond accompanying the drastic deflation in which farm prices were cut in two; to-day, a higher trend in farm prices toward a parity with other commodities and labor costs. This pendulum swing has been helpful, even though it needs to go still further.

Nor is this all. Over half of the three-billion-bushel corn crop will be converted on the farm into beef and pork; and rightly handled, at an additional profit over what would be realized were it all to be sold in the grain.

Meanwhile cotton prices have shown further material gains. Other staple and special crops, together with poultry and dairy products, have been leaving the farm on an advanced November price level.

Assuming the farm output of 1922 is distributed in an orderly manner, at a price level comparable with going quotations, it is not out of the way to say the farmers will have upward of two billion dollars more to spend during the next six months than in the opening half of 1922, when cereal prices made fair yet ragged recoveries. Fortunately for producers, the higher prices are obtainable this season early in the year, directly benefiting producers; something not always realized.

At the present time it is not so much the actual buying ability of the farmer which is important as it is his inclination or desire to buy. He is purchasing readily enough those commodities on which he feels a reasonable concession in prices has been made.

Prefers Automobiles to Plows

For this reason he feels more kindly disposed toward the automotive industry than he does toward the implement industry. It is estimated that the farmers of the country this year spent in the neighborhood of \$500,000,000 for motor cars and trucks, accessories and maintenance, while their expenditure for farm implements has not been the half of that. Nor is the explanation far to seek.

The reason for the farmer's friendliness toward the automobile in contrast to his aversion to the plow and the threshing machine is to be found in his estimate of the methods of pricing these commodities.

Automobile prices go up or down at the factory and dealer prices follow automatically. It happens that for nearly two years the trend of automobile prices has been downward, and that at the present time the prices on makes of cars most favored by the farmer are as low or lower than they were before the war. Automobile manufacturers have taken their losses, and prices of motor cars, in the eyes of the farmer, have been reduced to a level somewhere near that of former prices. Hence, he feels he can afford to sell wheat and corn and hogs and spend the proceeds for an automobile, for the prices have all been deflated.

That the farmer of the corn belt actually is purchasing automobiles, thus evidencing not only his willingness but his ability to buy, is demonstrated by the fact that at New Haven, Mo., 100 automobiles have been sold during 1922, "mostly to farmers"; that at Monticello, Ill., 225 automobiles have been sold during the year, "mostly to farmers," and that at Emporia, Kan., 100 automobiles have been sold during 1922, "about 50 per cent to farmers," and so on. Such instances run into the hundreds and provide the best possible proof of the ability of the farmer to get what he wants or what he needs.

Does Not Understand Implement Prices

Implements, on the contrary, have never been priced or sold like automobiles or like staples. For instance, implement prices never have followed closely the fluctuations in the raw materials which enter into them.

Furthermore, changes in implement prices always have been expressed in percentages, which make little or no impression upon the farmer mind, while price changes expressed in concrete amounts, like changes in automobile prices, make a decided impression.

Rightly or wrongly, therefore, the farmer believes that prices for implements have changed but little and still are high as compared with the prices he gets for his products.

The implement industry as a whole has been slow to realize that the farmer mind works along concrete rather than along abstract lines. Only recently has it come to see his preference for definite figures rather than for indefinite percentages.

The retail implement dealers were the first to sense this, and at the annual convention of their national federation held in Chicago a resolution was passed calling upon those farm equipment manufacturers who advertise nationally to use net prices, f.o.b. factory in their advertisements.

The dealers contended that this would tend to stabilize prices and correct some of the abuses of irresponsible competition because then every dealer could make the same resale price, with the freight to his town added to the factory price. Also, whenever it became necessary for the manufacturer to change his price he could express that change in concrete amounts so that the farmer could understand it.

This is clearly automotive practice and is only another indication of how fundamental automotive ideas are modifying customs and practices which have been in vogue for upwards of a half century in a kindred but much older industry.

It has been the custom of implement manufacturers, in attempting to change the farmer's conviction that implement prices are excessive, to quote the price per pound the farmer pays for what he buys. But this gets no one anywhere. The farmer is not impressed by the statement that his piano costs him 37 cents per pound or that his automobile cost 27 cents per pound, while for his implements he is asked to pay only 10 or 12 cents per pound. That isn't the way the farmer figures. He thinks implement prices are too high and for this reason he has been buying no more than he has had to have. Implement men fear he still feels the same way and will continue to defer his purchases indefinitely.

Buying Power Coming Back

The buying inclination of the American farmer is coming back but it is coming in a new way.

The farmer is buying, and buying generously, along certain lines, but the motives which prompt him are not the same as they were a few years ago. Times have changed and he has changed with them. Other and newer things appeal to him and one reason why the implement industry, as an industry, is languishing is because it still is trying to sell the "old" farmer in the old way.

The automotive element in the implement business has, on the contrary, kept up with the procession, and this is why automotive dealers are selling. They have recognized the changed conditions and they have changed their methods likewise.

It is a mistake to suppose the farmer spent \$500,000,000 for automotive products this year just because he wanted to joy ride. The automobile is a necessity for the up-to-date farmer. His car leaves the farm fifteen times where the old horse and buggy used to leave it but once and this simple fact goes far to explain the change that has taken place in the farmer market.

Necessity more than desire has governed farmer buy-

ing for more than the last two years and it will continue to govern his buying for some time to come. But necessity is a relative term and is interpreted differently by different farmers. To one the automobile may appear to be the greater necessity; to another the tractor, and to still another the plow or the threshing machine. But the farmer buys to meet whatever he considers is his particularly pressing need.

The farmer has been buying automobiles and not always the cheapest ones at that. Within a few weeks the writer talked with a dealer in a town of 3500 inhabitants who had sold 16 Studebaker cars to farmers and with another dealer in a town of 24,000 inhabitants who had sold 12 Packard cars to farmers. Such instances are so numerous as to be almost typical.

Steady Tractor Sales

Within the last few weeks also the writer has talked with automotive dealers in New York, Ohio, Indiana and Iowa who have sold as many as 57 tractors to farmers. In addition he has seen letters from individual automotive dealers in 13 states who report 1922 sales of tractors as follows:

Arizona .. 40	Iowa 11	Ohio 22	Kansas ... 25
Arkansas. 20	Iowa 16	Ohio 31	Michigan . 13
California 20	Iowa 11	Ohio 13	Montana .. 11
California 20	Iowa 10	Ohio 25	Nebraska . 12
Florida .. 15	Iowa 14	Ohio 22	Nebraska . 14
Florida .. 18	Iowa 20	Kansas .. 10	Nebraska . 33
Illinois .. 35	New York. 27	Kansas .. 22	Nebraska . 10
Illinois .. 18	N. Carolina 51	Kansas .. 47	Nebraska . 31
Illinois .. 56	N. Carolina 10	Kansas .. 25	Nebraska . 37

The modern farmer knows his needs more clearly than did the farmer of a few years ago and he buys more discriminatingly. The dealers who sell him are those who in turn have recognized the changed conditions and who are meeting them with up-to-date merchandising methods. It is no accident that these dealers happen to be automotive men for the most part. It means merely that they happen to be better business men than were the old-time dealers. The greatest trouble with the implement business to-day is that there are still too many of those old-time dealers hanging on.

The up-to-date dealer has been selling the farmer automobiles, tractors and other farm equipment all this year. This does not mean that the farmer is back to normal in his buying or that he already is buying as much as he will buy in the future, but he is meeting his immediate needs in ever-increasing volume. His buying power is coming back if the records that have been made during the last few months by automotive dealers are any criterion.

Straws in the Wind

The manager of a branch house of one of the big implement companies, a concern most intimately associated with the development of power on the farm and in the manufacture and sale of power farm implements said a few days ago that there had been from 200 to 300 per cent increase in dealer orders for 1923 spring deliveries compared with the orders placed a year ago.

Another implement manufacturer declared a day or so later that dealer orders for spring delivery thus far showed an increase of 200 per cent over orders placed a year ago at this time.

Within the last 30 days Floyd R. Todd, vice-president of Deere & Co., who was elected to the chairmanship of the executive committee of the National Association of Farm Equipment manufacturers at the annual convention of the association in October last has changed very

materially his opinion as to the business outlook. Thirty days ago he was a pessimist and could see no hope of better times in the implement industry until some time in 1924. At the annual meeting of the Tractor and Thresher Division recently in Chicago he expressed himself as highly encouraged over the prospect and intimated that the industry might look for much better things very soon.

In October last Todd said:

"It is my judgment that a number of factors are gradually working in the interests of the implement industry; that our drastic liquidation is over; that while the coming year is not going to be profitable, it will present less serious problems than either of the two years that have gone before, and that we can confidently look forward to the year 1924 as the beginning of a new era of demand for our products and a return to profitable operation."

In November Todd declared:

"The year which is just closing will write some more red-ink history into many of our balance sheets. The year 1923 seems to hold better things in prospect. A month ago I felt that while 1923 would be a much more favorable year than either of the two that have gone before, it was not likely to be a profitable one. The developments of the last thirty days, particularly in the increasing prices of farm products, have to my mind improved the outlook and I think that there are now possibilities that the year 1923 may cover the turning point when red-ink figures in our balance sheets will give place to black.

I am quite sure that this will be the case if farm products will advance so as to cover any increase in implement prices that may be made necessary by our growing costs.

"I am quite certain that with fair crops in 1923 there can be no question about the return to conditions of at least normal profit in the year 1924. It seems to me that the industry is now facing a gradually increasing demand which, within the next twelve months, will assume proportions of importance and bring back that measurable degree of prosperity to which so basic an industry is entitled."

Inasmuch as Todd is the recognized spokesman for the implement industry this change in his mental attitude is important and significant. In addition, it may be assumed that it represents fairly a cross section of the farm equipment manufacturers.

Thus all along the line the sentiment has been changing, particularly in the last 30 days. The implement industry is feeling better, largely because of the favorable reaction from the dealers, a very large percentage of whom are of the automotive type accustomed to automotive merchandising methods. It is these men who have come into the farm equipment trade so largely within the last few years who are putting the lever of better business and better merchandising methods into an industry which has been practically unchanged in these respects for 59 years. If the farmer is buying again and clearly he is, he is doing so primarily because better dealers are inducing him to do so.

Comparison of Grinding Practices in Industries

GRINDING practices of a considerable number of firms, several of them in the automotive industry, are dealt with in a descriptive way in "Production Grinding," by Fred B. Jacobs. The method of holding the work, the location of operations, grinding machine used, grit and grade of grinding wheel, number of grinding operations and stock allowed for grinding are given in most instances. Machine operations preceding or following the grinding are given in some cases to emphasize the importance of the grinding operation.

The appeal of the book is likely to be weakened somewhat by the tone of the introductory paragraphs of the different chapters (each chapter deals with the practice of one company), which often smacks of publicity. The accuracy of expression also leaves something to be desired. Thus, for instance, in the first chapter it is stated that "Almost innumerable time studies at this plant have proved beyond doubt that grinding processes in the manufacture of automobile parts is not only the most accurate method to use in producing parts in quantities. . . ." It is hard to see how time studies can prove anything regarding the accuracy of parts. In Chapter IX it is stated that "The principle involved in the modern roller bearing dates from the time when prehistoric man discovered that he could expedite the moving of a heavy body by placing it on rollers fashioned from the trunk of a tree." By the same token America dates from the time Columbus sighted land in the Caribbean Sea.

The concluding paragraph of the last chapter gives the impression that in the matter of precision of workmanship we are going backward. This chapter deals with Precision Grinding Work of Other Days and describes the work of the grinding department of the Reece Button Hole Machine

Co. which, about 1895, was in charge of Frank Hurd. Of Mr. Hurd and his work the author says: "Mr. Hurd was an accurate workman. Tolerances in those days were unknown. Thus a piece that called for a diameter of $\frac{3}{8}$ in. was finished to 0.375 in. It was neither 0.0001 over nor 0.0001 under. All work was gaged by micrometers which were frequently tested for accuracy."

The book is published by the Penton Publishing Co., Cleveland.

A NEW edition has recently been brought out by the publisher, M. Krayn of Berlin, of the *Work on Carburetors*, by H. Dechamps, originally published some 15 years ago. The new edition has been completely revised and contains additional material relating to aircraft carburetors, etc.

The book, which is printed in the German language, deals with the general principles underlying carburetor design, besides containing descriptions of numerous different constructions, both new and old. The theory of the simple spraying carburetor is developed, following which are discussed the various methods adopted for compensating for the tendency of this type to unduly enrich the mixture at high suction. All of the parts of the carburetor are then taken up in succession and the conditions which control their design are analyzed. The chapter on aircraft carburetors in the new edition has been written by Mr. Dechamps, the author of the first edition, while the work of revision generally was done by K. R. H. Praetorius. There is also a chapter on kerosene carburetors, which deals to a large extent with American practice in the tractor field. The book contains 227 pages (10 by 7 in.) of text with 189 illustrations.

Develops Plan to Solve Electric Equipment Service Problem

Special committee of Automotive Electric Association to offer recommendations. Stations properly fitted to service all makes of equipment to be installed with official authorization. Plan would benefit small town car owners as well as manufacturers.

SOME time during the next few weeks the Executive Board of the Automotive Electric Association will have presented to it a report of a special committee, appointed at the last annual convention of the association, which, if adopted, will go very far toward solving one of the most serious and perplexing of the problems which confront the manufacturers of automotive electric equipment. The problem is that of servicing effectively and economically the standard electric equipment used on motor cars.

The special committee will present the plan to the Executive Board in the form of a resolution. It will recommend the institution and authorization of electric service stations throughout the country which shall be equipped for servicing all makes of automotive electric equipment. It will urge that the Automotive Electric Association officially authorize these stations to service all electrical equipment manufactured by the members. The membership of the association comprises almost 100 per cent of the automotive electric equipment manufacturers, hence if the resolution be adopted and put into effect, service will be available wherever one of the authorized stations may be located.

The plan to be recommended by the committee follows closely in detail some of the plans already employed by several of the automotive electric manufacturers to insure service on their equipment and to protect their guarantee. Some of these plans are quite elaborate and have in their development already hundreds of authorized service stations. Difficulty has been met in that an insufficient volume of service calls has made equipping for service on just one make of electric equipment unprofitable for the station except in the large centers of population. Also as the plans are worked at present, there is very commonly a slip up somewhere along the line, so that the manufacturer cannot insure service being rendered in all cases by the station he authorizes.

THE plan suggested by the committee of the Automotive Electric Association would substitute for this individual plan one which would include all of the systems manufactured by its members. This would make the probable volume of service greater and more profitable per station, insuring better equipment for service and more competent service. This last consideration is particularly important in the smaller communities of the country.

Hitherto servicing automotive electric equipment has

presented a serious problem due to the peculiar conditions surrounding guarantees covering electric equipment which has been and is now employed as standard equipment on motor cars. This is due to the twofold nature of the guarantee which equipment the manufacturers must give.

For instance, there is the phase which affects the relation between the electric equipment manufacturer and the motor car manufacturer. This is relatively easy to meet, since the engineering departments of the car manufacturers nearly always can assure themselves by test whether the representations made by the equipment manufacturer are justifiable and dependable. It is fair to assume that the car manufacturer has satisfied himself on this point before any electric system is adopted.

The other phase of the equipment manufacturer's responsibility presents itself after the car has left the hands of the car manufacturer and passed through the channel of the car distributor and dealer into the hands of the ultimate purchaser.

IT is customary for the automotive electric manufacturer to place a guarantee on his equipment which is limited both in scope and time and which presupposes some degree of responsibility and cooperation on the part of the car owner.

The automotive electric manufacturer is forced to give this guarantee because the car manufacturer's guarantee very plainly and emphatically disclaims any responsibility for parts or accessories on his car which are not of his own manufacture. The car manufacturer never makes his own electric equipment, hence he is absolved from any responsibility for it. He puts it up to the equipment manufacturer to protect not only the reputation of the car as a whole, because that will depend largely upon the durability, capability and dependability of the electric system, but also to protect the guarantee of the latter which affects his own electric equipment.

The problem which the automotive electric manufacturer must solve, therefore, is how he is to follow his particular equipment into the hands of the car owner. He must see that the latter observes the conditions of the guarantee he accepts and make sure that the right kind of service is rendered on the installation, to the end that car owners shall be satisfied and that the standing and reputation of both car and electric equipment do not suffer.

This is the more difficult to do because, as a rule, the automotive electric manufacturer never comes into direct contact with the car owner. Most of the devices and

plans designed to meet this situation in use to date have proved unsatisfactory and incompetent to insure even indirect contact through dealers, repair shops and service stations.

All manner of expedients have been tried to bring about this contact, to insure co-operation on the part of the car owner which will protect him and which also will enable the equipment manufacturer to make good on his guarantee. While some of them work more or less efficiently, the majority break down because some of the intermediate factors between car manufacturer and car owner do not do what they ought to do.

NO plan has been devised to date which appears to correct the weaknesses which seem to develop inevitably in every plan tried. This is particularly true when the car owner lives in the smaller communities of the country or in the rural districts.

The situation is somewhat better in the larger cities because service stations have grown up there during recent years which specialize on automotive electric equipment and which, for their own interests and to advance their own business, make a conscientious and determined effort to get into contact with the car owner and to solicit his business. Typical among such metropolitan electric service stations are Cowie in Kansas City, Jones in Chicago and Reinhard in Minneapolis. Similar institutions commonly may be found in most of the larger cities.

Recognizing the importance and convenience of such institutions, and appreciating how much they can do to render the automotive electric manufacturer's guarantee effective, the custom has grown up of giving official authorization to such electric service stations qualified to service automotive electric equipment. It is very common to find such a station authorized by practically every automotive electric manufacturer in the country to service his equipment. Also there are numbers of electric service stations which specialize on only one or a few makes of electric equipment.

When combined, these exclusive and general electric service stations meet fairly well the requirements in metropolitan districts. In all there are, to date, some 1500 of these officially authorized stations. Most of them are located in the larger population centers, leaving the smaller towns singularly devoid of competent electric service. Possibly it is in these smaller communities and rural districts that electric service is most acutely needed.

It is this condition in the smaller towns which the special committee of the Automotive Electric Association hopes to meet by the adoption of its recommendation.

Most of the automotive electric manufacturers cannot economically maintain such a multiplicity of service stations as would be required should all attempt to follow the example of the few who have established individual stations. The association stations, therefore, would meet this situation.

It happens that this problem is being solved already in whole or in part in certain sections. Take the State of

Ohio, for example. Entirely through the instrumentality of the Cleveland Ignition Co. of Cleveland, fifty-five regularly authorized electric service stations have been established in that State, mostly in county seat towns, and through these competent and efficient electric service is being given to car owners in the smaller towns.

Each of these stations works under factory contracts which are made by the Cleveland Ignition Co. Each has a territory within which it has exclusive rights of service on certain equipment and of sale on genuine parts for one or more of the automotive electric systems commonly in use as standard equipment. The number of systems serviced and on which exclusive rights are given is determined in every instance by the extent of territory controlled by the Cleveland Ignition Co. On some of the products it services in its Cleveland shop it has the entire State and on others only a part of the State. However, in so far as the company itself has exclusive rights and protection it gives corresponding rights and protection to all the authorized service stations it establishes.

The Cleveland Ignition Co. started originally as an exclusively local electric service station. As its business grew it acquired the authorized local rights to service more and more systems of electric equipment. To-day it is authorized to render electric service on Delco, Remy, K-W, Bijur, Dyneto, Atwater-Kent, Splitdorf, Eisemann, Zenith, Briggs & Stratton, Fafnir, Connecticut, Westinghouse, Bendix and Johns-Manville. Its control on some of this equipment is purely local; on others it has rights which extend over varying areas within the State.

Impressed by the success which attended the development of its local business, and sensing the importance

of extending similar service wherever possible throughout Ohio, the company began, about three years ago, to select men either competent already, or who could be trained to become competent, to render exclusive electric service in the smaller towns in the State. As rapidly as such stations were established they were given the exclusive rights to sales and service on such electric equipment as the Cleveland company was authorized to give. Also each station established was accorded official recognition by designating it an authorized electric service station by the Automotive Electric Association.

This development in Ohio seems to solve many problems. It has solved the problem of distributing electric equipment through the small towns effectively and economically and that of selling accessory parts on which the element of service and not that of merchandising is the predominant factor.

IT establishes a body of electric service men so bound by factory contracts and so protected by generous discounts on parts that they will handle nothing but genuine parts, thus limiting the opportunity and trade of the gyp concerns which used to flourish by selling substitute parts in these communities. It makes obligatory at all times a conveniently available stock of genuine parts commensurate with the car population of the locality.

THE problem of getting adequate service on electrical equipment as well as on the motor vehicle has been a stumbling block and source of much friction within the industry.

Manufacturers of both equipment and motor vehicles have had their reputations damaged by the lack of proper servicing on the product of the former. The car owner has suffered and has demanded that there be an improvement.

This article tells of the solution proposed by a committee of the Automotive Electric Association. It shows that co-operation among the equipment manufacturers is absolutely necessary to insure the car owner getting the service that is rightly his and outlines the method to bring it about.

This development makes possible the maintenance of a traveling organization which can represent economically the automotive electric manufacturers who are willing to grant the Cleveland company territorial rights and who could not afford to travel the territory individually. In short, it furnishes the solution of the problem which the automotive electric manufacturers must meet in coming into contact with the small town car owner, and thereby protects not only his guarantee and reputation but the reputation of the car manufacturer as well.

If the Automotive Electric Association should adopt the

recommendations of its special committee this plan of electric service stations could be spread rapidly throughout the small towns of the country. Some such plan as that employed by the Cleveland Ignition Co., authorized by the association and thus servicing all makes of automotive electric equipment, would correct the weak spots at present apparent in the Cleveland plan and would make possible the rendering of efficient electric service everywhere. Some such development is desirable, and it should be encouraged by all factors interested in the manufacture of automotive electric equipment.

Field of Airship Transportation Distinct from Other Carriers

IN a paper presented at the annual meeting of the American Society of Mechanical Engineers, Ralph H. Upson, chief engineer of the Aircraft Development Corp., stated that the improved airship will be available for commercial traffic over either land or water in rough proportion to the extent to which the following conditions exist:

- Length of route should be 500 miles or more.
- Density of traffic—at least 200 passengers or 50 tons of goods per trip.
- Time-value of pay load—passenger's time worth \$6,000 per year or more; goods \$2 per ton-hour.
- Favorable meteorological conditions—(no definite minimum)

Upson arrives at the above conclusion through a study of the prime factors or variables entering into the consideration of a commercial airship line, namely size, speed, route, cost of transport and time value.

On the basis of this study Fig. 1 shows a comparison between all the available means of transportation.

Here the speed is taken as net, with allowance for average stops, delays, time required to get in and out of terminals, and to load and unload. The shaded areas represent the respective economic fields to be served by steamship, railroad, and airship, which may be termed primary transportation units. The secondary units, motor truck and airplane, are not directly comparable with the others because their value lies in various special features peculiar to themselves.

In respect to size the airship is affected in much the same way as the steamship. The weights of various parts of an airship structure vary all the way up to the fourth power of the linear dimensions. Hence beyond a certain point there is an actual increase in structural weight per unit displacement. Considerations of power

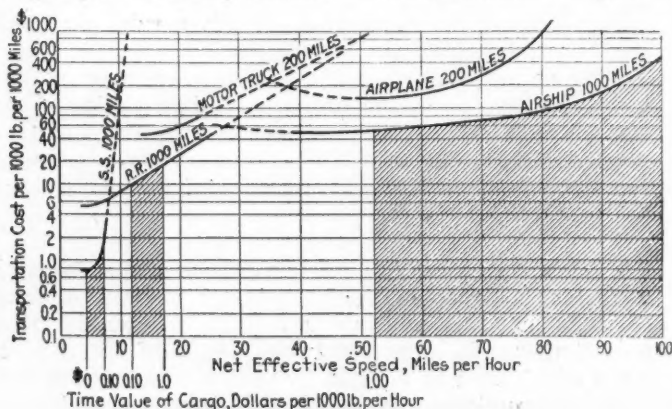


Fig. 1—Transportation diagram showing economic relationship between different carriers

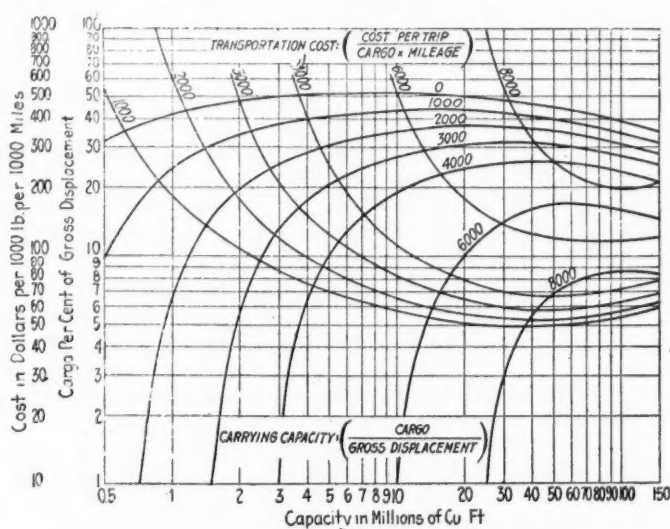


Fig. 2—Effect of size on airships of similar design, assuming an average air speed of 70 m.p.h.

and fuel consumption, however, bring the range of economical size far beyond that of greatest structural efficiency. This is because the resistance, for equal speeds, varies as not quite the square of the linear dimensions.

All the above data have been taken into account in computing the data for Fig. 2, which shows the effect of size alone on freight service over routes of different lengths. The curves that are concave downward show the net cargo weight as a percentage of the gross displacement weight, the figures on the curves themselves referring to the length of route in statute miles. The other set of curves (concave upward) shows the cost of transport in dollars per 1000 lb. per 1000 miles for the different routes marked.

This takes care of three of the prime factors or variables entering into the consideration of a commercial airship line. The remaining two factors are cost of transport and time value. The latter is the value of time, or of saving time, per unit of passenger or cargo carried. Taking the simpler case of freight (including mail and express), if time has any value it has a money value per hour on any unit weight of the cargo carried.

Taking everything into account on a basis of present values, it seems probable that anything having a time value of \$1 or more per 1000 lb. per hr. (\$2 per ton-hour) can be shipped more economically by air than by rail, or about half of this figure in the case of shipping by water. This is assuming in each case the speed and size of unit best suited to the quality of goods carried.

Liberal Credit Policy Will Develop Automotive Market in Holland

American exporter's handicaps gradually being overcome and German lead wanes. More liberal terms to dealers result in price reduction and help neutralize unfavorable rates of exchange.

By E. C. Petrie

HOLLAND is a country of intensive production and demands intensive transport facilities. A small country, with a large overseas trade, it has realized that, if it is to maintain its commercial position, it must make the most of the benefits offered by the internal combustion engine. Increasing railway deficits in a land inhabited by a conservative, level-headed people, backed by slow deliveries, growing pilferage, and high freight rates, has driven home this fact very forcibly.

Though its motor transport advance has been rapid, this market is still a long way from a saturation point. Registration figures issued last February show that there are 20,000 motor vehicles in Holland. A proportion of one motor car to every 350 inhabitants indicates that for such a wealthy country many potential buyers must be ripe for the enterprising salesman.

Since 1920 Holland's imports of motor vehicles have been as follows:

	1920	1921	1922
		(First quarter)	
Passenger cars	6,089	2,843	652
Car chassis	767	269	?
Trucks	1,646	728	302
Truck chassis.....	789	287	144
Motorcycles	11,439	5,660	?

These figures suggest that though passenger cars imported during 1922 will be on a par with the figures of last year, the absorption of trucks will closely approximate the total of 1920. One hundred of the truck chassis imported during the first three months of this year came from the United States; Germany sent 30, and France the remainder.

The chief supplying countries of complete vehicles during this period have been:

	1920		1921		1922	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
Germany	2,144	1,398	1,224	573	388	289
United States ...	2,968	83	520	29	148	..
France	235	63	468	66	..	9
Belgium	402	..	286
Great Britain ...	207	..	167
Italy	67	..	94
Other countries .	66	102	84	60	126	4

A comparison of the unit value of vehicles imported from these countries is interesting:

	1920	1921
Germany	Fl. 3,451	Fl. 4,003
United States	4,111	4,038
France	5,106	5,555
Belgium	4,726	6,993
Great Britain	6,280	6,587
Italy	4,818	5,799

It will be seen from these figures that the unit value of the American vehicle dropped to within Fl. 35 of the value of the German product; that double the number of French cars were imported, that the Belgian vehicle increased almost 50 per cent in price, and that British cars, despite their high cost, only fell about 14 per cent during a period of depression.

America is making a great effort to regain its position as the leading supplier of Dutch motor needs. It suffered last year as a result of overstocking in 1920, to German underselling, to unfavorable exchange, and to an unsatisfactory selling policy.

This policy is being radically amended. Under the old system vehicles were bought cash down by Dutch dealers, and this body, to ensure profits, increased the selling price to such an extent that the cost of an American car to a Dutch buyer was double that of its retail value in the United States. Credit terms to dealers and quotations c.i.f. Dutch ports are the sales methods now being adopted, and, as a result, current American truck prices have already fallen 44 per cent this year compared with last, while car prices are 35 per cent lower.

German Competition Wanes

At the same time, the bogey of German competition in Holland is being dispelled. Certainly, many German vehicles are entering the country this year, but mainly because outstanding contracts are being fulfilled. Dutch owners of these vehicles are discovering that they are expensive to keep in repair, and their popularity, induced by low price, is waning. It is not improbable, therefore, that by the end of this year Holland will have lost its place as the leading absorber of German motor products.

British vehicles, despite German dumping and American and French activity, show a tendency to interest Dutch buyers. Their excellent construction and reliability will result in increasing sales, and particularly noteworthy is the current demand for municipal vehicles.

The one-tonner is the most popular type of truck, and, while there is a certain demand for the high grade car, medium and light types attract more buyers.

Holland has been described as a pocket paradise for motorists, for the country is flat and the roads generally are good. Vehicles for the Dutch market, therefore, need not be powerfully engined. Cabs for trucks should be so constructed as to protect drivers from cold winds and rain.

The secret of successful representation in Holland lies in the establishment of adequate service facilities, and complaint has been made that some manufacturers have been lacking in this respect. It is well to remember that one of the most potential markets in the world, the Dutch East Indies, obtains many of its motor vehicles through Dutch dealers.

Holland Needs Automotive Imports

As practically all raw materials necessary to the manufacture of motor products have to be imported, as wages are high and the country demands a great variety of vehicle types, it is improbable that Holland will ever become self-supporting as regards automotive products. A certain amount of manufacturing activity, however, exists, and recently a maker of motorcycles was seeking representation in Egypt and the Levant.

The United States contributed 52 out of the 102 tractors and steam wagons imported by Holland last year. Germany sent the remainder, excepting for a few steam wagons sent by Great Britain. The larger farms in the northern and eastern districts benefit most by power farming methods, and good sales should be effected in these districts. In the other parts of the country small holdings and market gardens predominate, and here the tractor is only a moderate marketing proposition.

Commercial aviation is making great strides in Holland. Over the lines subsidized by the State 1,548 kilog. of mails, 38,634 kilog. of goods, and 1,674 passengers were carried last year against 2,962 kilog. of mails, 21,963 kilog. of goods, and 345 passengers in 1920.

Holland is actively engaged in airplane construction, and just recently a new factory was opened at Rotterdam.

During the first three months of this year 18 airplanes were exported, 10 of this number going to Russia. A further 10 machines have also been ordered by the latter country from the Fokker factory at Veere for

use over the Moscow-Konigsberg route. These machines are planned to fly 100 miles an hour and have been fitted with 350 hp. Rolls-Royce engines.

Motor barges are very popular in Holland, and are becoming a feature of its canal traffic. Most of the engines fitted to these craft are manufactured in the country, but it is thought that imported engines could successfully compete in supplying the fool-proof, crude oil burning type that is most in demand.

The value to Dutch fishermen of motor-propelled craft is shown by a study of last year's herring fishing operations. Of the 86 luggers employed in this industry six were motor driven, and, whereas, the average annual catch of the sailing lugger was valued at Fl. 11,040, the revenue of each motor lugger was valued at Fl. 20,799.

Holland is potentially a great motorcycle market. It is said that the country possesses more bicycles per capita than any other country in the world, and in some trades 90 per cent of the employees cycle to work. Both sexes have the touring mania. One of the railways' most acute problems is to transport bicycles on a Sunday or holiday afternoon and stringent regulations on the part of these companies are driving many cyclists in the direction of a natural ambition—the possession of a motorcycle. Besides solo machines, light combinations will always be in demand, for even with only a day available the Dutchman will go touring with his family.

At the Amsterdam Motor Exhibition held this year motorcycles were strongly represented. Forty makes were on view, the exhibits of American, Belgian, British, French and German manufacturers. British machines are viewed with considerable favor by the Dutch, and it is in this branch of the motor industry that British competition is most to be feared.

About 75 per cent of the business done at the last Amsterdam show is said to have gone into American order books. In all 150 vehicles were exhibited, the products of one Dutch, two British, 11 German, 12 French and 16 American makers. About 50,000 visitors were attracted. Stalls, both at this and the Spring International Fair at Utrecht, are worth taking by American makers, for it is in the early part of the year that Dutch dealers seriously consider the replenishing of their stocks. Not only is there the expectation of the home summer demand, but about this time thousands of vacationists arrive from the Dutch colonies, many of them armed with buying commissions.

Two-Thirds of British Road Accidents Due to Fault of Drivers

THE British Ministry of Transport has been conducting inquiries into a number of road accidents which have occurred during the period January 1 to August 31, 1922, and in a statement which is issued it is pointed out that the number of accidents due mainly to negligence or incompetence on the part of drivers forms almost exactly two-thirds of the total.

The Ministry has no authority to hold public inquiries concerning road accidents or to take evidence on oath, but private inquiries were made into the causes of 94 road accidents during the period named. An analysis of the results is given below. It should be understood that more than one of the causes named may be contributory to any particular accident, so that the classification is approximate to a certain extent, but nevertheless indicative of conditions.

Cause	Accident	Killed	Injured
Negligent driving	55 (58.5%)	35 (46.6%)	90 (60.8%)
Faulty judgment	6	17	5
Inexperience	1	1	..
Insufficient lighting	1	..	2
Faulty steering gear ...	5	2	12
Burst tire	1	1	4
Mechanical defect	1	..	1
Faulty brakes	4	4	9
Rear axle failure	1	..	2
Missed gear change ...	1	..	2
Pedestrian at fault	5	5	5
Bicyclist at fault	1	..	1
Alighting from moving bus	1	..	1
Horse took fright	2	1	2
Unknown	5	7	2
	94	75	139



Electrical Standardization Will Lighten Industry's Burden

Improvement in Service Will Help Foreign Trade. Service Must Be Built into Product, Not Furnished Second Hand After Sale

Editor, AUTOMOTIVE INDUSTRIES:

AUTOMOTIVE INDUSTRIES is much to be commended for the space it is giving to the subject of Electric Equipment Standardization, and C. B. Griffin's article in the Nov. 30 issue should go a long way toward convincing the industry of the vast importance of accomplishing this result.

If the automotive industry as a whole prospers, its individual concerns prosper. Undoubtedly the industry will prosper in proportion as it serves its clientele, the buying public. It can serve the public in no better way than to simplify design details on the basis of designs that are most serviceable to the motor car owner; for the more reliably and economically he can run his car, truck, bus, etc., the more widely and rapidly will the field for these vehicles extend and insure increased sales.

The public is vitally concerned with reliability of operation and pays less and less attention to details of construction. Most folks know little more of the internal workings of an axle or a motor than they do of a mongoose—and they care less so long as the vehicle carries them or their goods cheaply and safely to destination, especially if repairs can be made quickly and cheaply when necessary.

The era of detail variations for individuality's sake has long passed, but the curse of a multitude of non-essential variations in parts is with us to an astounding degree. This calls for heavy service station inventories and expert mechanics' wages that annually run to millions upon millions of dollars, and it induces the manufacture of pirate parts. Sometimes it seems as though the public paid the bill. But really the automotive industry bears the burden, for the millions spent on service parts and labor should go toward the purchase of new cars, trucks, etc. Further, a reduced maintenance charge will induce more sales, the first investment having more than justified itself.

To supply electrical equipment to cover the unwarranted variations in engines that exist to-day means a heavy expense to the manufacturers of this equipment. This expense is reflected in the sale price of the equipment. The condition entails much more care in their manufacturing and engineering departments. Even then mistakes are made, which not only cost money but put a burden of worry on the executives and engineers when these men should be spending their time with clear minds, to better and reduce the cost of a simple line of serviceable parts.

C. B. Griffin makes a plea for reliability and repair accessibility, as against the tendency to shave off a cent in first cost wherever possible. C. F. Kettering, in addressing the S. A. E. Production Meeting in Detroit, stresses the importance of having "a minimum number of places in

a car to get out of order." The call to the automotive industry to-day is to produce vehicles into which "service" is built rather than furnished second hand at a comparatively extravagant cost when the car is in the hands of the user.

Standardization must be patiently and conscientiously done so as to embody the best knowledge and practice, cover an adequate range of sizes, reduce net costs, and be capable of progressive adoption. This done, the standardization of many details will go a long way toward furnishing vehicles with "inbuilt service" as well as quick repair service. It will make cars more serviceable and therefore more profitable to the owner. It will mean more profit for the vehicle manufacturer. It will mean more profit for the parts manufacturer. It will mean fewer worries on the part of any of these three, more dependable sources of supply, and a much lower service inventory.

It will mean a big advantage to American cars in foreign trade to be able to serve them with a large number of parts from one big warehouse. For American cars first have to meet competition as American cars, and where foreign concerns may have many local advantages. The cars that serve and are serviced best, however, are bound to win markets, and the industry can well afford to give close attention and substantial support to Mr. Griffin's plea for electric standardization, and to similar work in other fields.

CORNELIUS T. MYERS.

Dilution and Oiliness

Editor, AUTOMOTIVE INDUSTRIES:

A. Ludlow Clayden's recent article on Dilution and Oiliness brings out some interesting points on the relation of dilution to viscosity. I am not sure of the soundness of his contention that diluted oil of the same viscosity as clear cut oil is unsuited for cylinder lubrication. It looks like a logical conclusion, but I don't know of any real data on the subject.

The effect of dilution on carbonization is probably as bad as he makes it. He is also right in saying that we know little or nothing yet about oiliness.

I also agree that a dilution indicator on present-day cars would be a good thing. Of course, the oil pressure gauge as distinguished from the pressure indicator may serve this purpose to a limited extent.

His last statement about the responsibility of the engineer, or better, the production manager, for dilution is, I believe, all true, but likely to be unpopular.

H. C. DICKINSON.

Research Manager, Society of Automotive Engineers.

American Exports of Cars and Trucks for October, 1922

COUNTRIES	GASOLINE PASSENGER CARS						GASOLINE TRUCKS						PARTS
	Up to \$800		\$800 to \$2000		\$2000 and over		Up to 1 ton incl.		Over 1 to 2½ tons		Over 2½ tons		
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	Value
Europe													
Austria.....													\$590
Belgium.....	333	\$93,997	32	\$35,917			212	\$50,102					65,259
Bulgaria.....													136
Czechoslovakia.....	4	1,731					2	758					180
Denmark.....	5	2,423	7	8,386			1	871	1	\$1,088			17,632
Finland.....	6	3,960											73
France.....	2	926	3	3,674	1	\$3,000			2	5,200			298,769
Germany.....	5	1,572	3	3,048									4,150
Gibraltar.....			4	5,100									15
Greece.....	8	4,243			1	2,263							1,941
Hungary.....													300
Iceland and Faroe Islands.....			4	4,278									6
Italy.....	2	750	1	923	1	2,200							652
Malta, Gozo and Cyprus Islands.....	7	2,636											716
Netherlands.....	8	5,187	4	5,050	2	5,925							6,251
Norway.....			2	2,250									5,873
Poland and Danzig.....	5	3,427	4	4,000			1	650					6
Portugal.....	3	2,261											447
Roumania.....	13	4,136	1	1,500	1	3,000							3,957
Russia in Europe.....	10	3,805					17	8,262					1,205
Spain.....	42	27,542	77	89,440	6	20,439							45,930
Sweden.....	68	51,148	69	64,760			1	2,000	1	2,600			23,702
Switzerland.....	6	3,455	9	9,589	5	15,163							1,814
Turkey in Europe.....	10	3,864	1	1,149									544
England.....	198	146,381	88	95,361	14	46,332	10	9,870	13	13,479			179,629
Scotland.....	1	300											14,718
Ireland.....	10	3,920											
United Kingdom.....													
Yugoslavia, Albania, etc.....	1	414											2,559
North and South America													
Bermuda.....													22
British Honduras.....													351
Canada.....	234	126,916	406	479,298	54	147,733	19	10,087	50	73,678	14	\$42,768	1,401,966
Costa Rica.....									1	1,088			1
Guatemala.....	1	500	2	2,744	1	2,070							1,743
Honduras.....	1	500					1	651					2,582
Nicaragua.....													97
Panama.....	13	8,449	17	20,335									3,893
Salvador.....			3	3,200									1,502
Mexico.....	489	197,626	240	235,359	12	33,039	63	36,998	15	18,730			95,536
Newfoundland and Labrador.....			1	939									1,537
Barbados.....			3	4,000									1,175
Jamaica.....	24	10,536	11	13,844			6	2,820					10,526
Trinidad and Tobago.....	9	3,591	2	2,120			5	1,820					4,544
Other British West Indies.....	19	7,571	7	8,638	1	2,200	5	1,956					3,649
Cuba.....	204	73,128	19	24,463	20	46,799	21	9,893	4	6,151			68,247
Dominican Republic.....	15	6,628	6	6,601					1	1,749	2	3,966	14,565
Dutch West Indies.....	5	1,751											1,139
French West Indies.....	3	1,309											1,742
Haiti.....	17	10,738	1	1,500			1	404	1	1,256			4,530
Santo Domingo.....													
United States.....													
Virgin Islands of U. S.....	1	445											1,697
Argentina.....	275	179,098	206	203,810	10	26,717			3	3,673			181,788
Bolivia.....													239
Brazil.....	61	43,136	94	97,959	5	14,736	1	792					341,901
Chile.....	50	18,450	7	8,620			19	8,508					11,087
Colombia.....	12	6,906	23	25,109	2	5,000	3	3,056			1	1,983	11,183
Ecuador.....			1	1,397									3,248
British Guiana.....	10	4,876	3	2,757									682
Dutch Guiana.....	3	1,168											1,195
French Guiana.....	1	414											130
Peru.....	2	900					2	1,556					7,223
Uruguay.....	157	60,752	33	34,618	1	2,678	41	10,835					9,515
Venezuela.....	45	18,094	6	5,417	3	9,106	1	439	1	1,250			6,722
Asia													
Ceylon.....	22	14,395	7	6,954			1	1,213	2	3,048			2,154
China.....	40	25,037	15	18,940	1	2,500			4	4,472			9,401
Chosen.....	1	50											6
Kwantung.....													
British India.....	59	33,434	9	10,863			5	4,856	4	7,061			33,074
Straits Settlements.....	29	21,854	6	6,327									1,801
Java and Madura.....													7,396
Other Dutch East Indies.....			2	1,836									840
French Indo China.....													30
Hejaz, Arabia and Mesopotamia.....													8,011
Far Eastern Republic.....													70
Hongkong.....			2	3,300	3	8,400			3	4,906			1,863
Japan.....	170	68,459	22	21,940	10	23,898	3	1,125	6	11,631	31	183,162	39,428
Palestine and Syria.....	52	26,031	16	16,102			4	5,314	3	3,451			6,986
Persia.....													171
Philippine Islands.....	45	29,316	36	36,402	1	2,414							13,064
Siam.....			1	1,800									16
Oceania													
Australia.....	831	513,380	645	690,850	28	69,369	44	43,897	52	69,601	9	12,999	101,573
New Zealand.....	103	62,008	95	103,067	1	2,026	4	10,320	17	24,320	8	17,716	23,801
Other British Oceania.....	2	920											38
French Oceania.....	1	200	2	2,485									283
Other Oceania.....	12	6,709											100
Fiji Islands.....													
Africa													
Belgian Congo.....	6	2,318					8	3,232					30
British West Africa.....	4	2,020	4	3,318			20	17,590	3	4,320			6,451
British South Africa.....	41	27,786	137	136,381	1	4,500			1	2,600	1	4,200	17,004
British East Africa.....	8	4,366	4	3,479									4,501
Canary Islands.....	3	1,820	3	3,342			10	4,600					6,103
Other French Africa.....	3	1,243											
Egypt.....	8	4,661											3,330
Liberia.....													979
Portuguese East Africa.....	4	2,052					3	2,261					190
Other Portuguese Africa.....	11	5,505					1	305					
Spanish Africa.....			2	2,233									
Other Countries.....													
Total.....	3,853	\$2,005,124	2,408	\$2,587,081	185	\$501,507	537	\$257,809	188	\$265,352	66	\$266,794	\$3,164,810

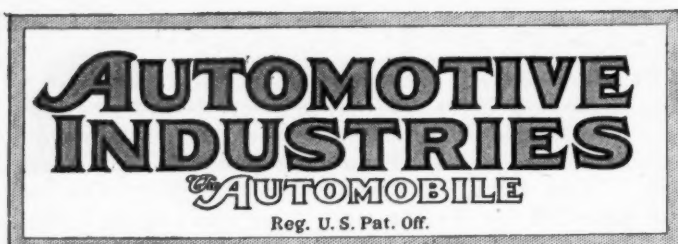
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Large High Speed Engines

RECENTLY there appears to have arisen a demand for high-speed—and consequently light—engines of 80 hp. and over, for such purposes as high-speed trucks, omnibuses and railcars. Engines of the marine type of this output are on the market, but they are not fast enough and therefore too heavy. It seems that with the improvement in highways there has come a demand for the transportation of passengers in public services and for goods transportation at speeds which are comparatively much higher than have been customary heretofore. The introduction of giant pneumatic tires is, of course, also in a large measure responsible for this development.

At the present time people working in these fields are hampered by the lack of suitable engines. There should be no difficulty in building engines for this class of service having an operating speed corresponding to from 1600 to 1800 ft. p. m. piston speed. While

the demand for such an engine might not be large at first, it is quite certain to increase as the tendency in transportation is constantly toward higher speeds.

Constructive Publicity Needed

AUTOMOBILE manufacturrs and dealers sometimes feel that newspapers aren't as liberal as they might be in the way of publicity. In some cases that may be true but in many instances the wonder is that they use as much as they do of what is sent them under the name of publicity.

In this connection there is the text for a sermon in the position taken by the New York *World* which has sent a circular letter to the trade asserting it is convinced the time has come when individual "puffs" and free "publicity" items "are of no value to the industry and of little interest to the reader."

The *World* adds that "the reader is keenly interested in live, general news of the industry" and that in future it will handle automobile news in this way, eliminating individual "publicity" items and devoting its space "to live news of the industry handled in a big way, and articles of interest to motorists."

The newspaper says it "will endeavor to build up a real interest in its automobile pages among its motorist readers." If it does, it will be doing more than most papers have accomplished. There is mighty little reader interest in the average automobile page. Too often the news space is doled out with an eye on the advertising columns.

We believe with the *World* that there is a genuine interest in live news of the automotive industry and we are convinced the time has come when the industry as a whole should have constructive publicity, built on a bed rock of truth. More newspaper readers are interested in automotive products than in any other commodity except the necessities of life. In point of general interest it marches close behind the theater, the motion picture and professional baseball.

There is plenty to say to which would be well worth printing as news. Why not say it? Let's get away from the methods of the circus publicity hounds.

No More Easy Profits

THERE have been many favorable comments on the paper of H. G. Person, managing director of the Taylor Society, printed recently in AUTOMOTIVE INDUSTRIES, in which he called attention to the necessity of shaping management to meet changing industrial conditions. In this connection it is interesting to note in a prospectus of "Economics for Executives," written for the American Chamber of Economics, the statement that while the man who "sat tight" and managed with passing ability was reasonably sure of a profit in the period from 1900 to 1920, the next swing will be of even longer duration and "during it profits will go only to those who manage with exceptional ability. The merely passingly capable business man will find it difficult to carry on."

Capable management will have much more to do with profits in the future than in the recent past.

Highway Transport Regulation Program Lacking

WITH the near approach of the legislative season, motor truck regulation seems to be in the air. Various States propose to exercise a closer supervision over their operation and it is probable several law-making bodies will enact statutes placing highway transport under control of public utility commissions or similar bodies.

We stated some time ago that if State regulation is to be sane, fair and simple instead of burdensome and even confiscatory, it is high time motor truck interests agreed upon some definite program for presentation of their cases to legislators.

The American Electric Railway Association, old and experienced in legislative affairs, adopted at its convention in October a proposed uniform statute for the regulation of commercial vehicles. It was worked out by a special committee. Some of its provisions are satisfactory to truck interests, but some of them are not. It will give the traction companies a platform upon which to stand, however, in relation to their buses and competition by independents.

The motor truck committee of the National Automobile Chamber of Commerce, in co-operation with the Motor Vehicle Conference Committee, has sent a draft of its views on the subject of regulation to truck manufacturers, but it has been impossible to prepare a report up to this time because the replies have come in very slowly. The automotive industry, therefore, will go into the new year with no very definite notion of what it thinks would be a fair measure of regulation.

Hindsight is much less difficult than foresight, but it's a heap less helpful.

Numerous interests are crying for regulation of highway transport. The voice heard loudest is that of the railroads. They are actuated by purely selfish motives. Their arguments are too familiar to need repetition. If the time comes in a few years, as it is quite likely to, when they will be operating large fleets of trucks themselves, they may wish they hadn't raised such an outcry.

The traction companies want exclusive franchises to prevent the competition of jitneys and independents with their bus lines, but they are not eager for the type of regulation which would injure their interests.

Some organizations of selfish motorists would like to have the commercial vehicle taxed off the highways so it wouldn't interfere with their cars. They are working

against it insidiously by carefully veiled propaganda directed against the building of hard surfaced roads. They are playing into the hands of the railroads.

Most passenger car operators, while not opposed to the truck as a means of transportation, feel a perfectly logical resentment against those operators who drive heavily loaded vehicles at an excessive speed and hog the road, endangering the lives of other users of the highways.

People who do not drive cars of any kind, and they are still the big majority, are up in arms against the truck because they hold it responsible for many deaths and injuries on the highways.

Operators of regularly organized freight and passenger transportation lines would like to see regulation which would protect them from "fly-by-night" competition.

Some measure of State regulation is coming. It depends largely upon motor truck interests themselves whether it shall be really burdensome. It is much easier to have an oppressive bill amended so that it will be reasonably fair than it is to have an evil law repealed once it is on the books.

The railroads lost the right to make their own decisions on rates, new lines and various other questions because of the wrongs done the public through unjust and unreasonable charges, unfair rebates to favored customers, discrimination in service, discrimination in rates to certain localities and commodities, lack of uniformity in rules, practices and classifications.

Highway transport is assuming large proportions. Up to this time its rates, practices and methods of competition have been practically unregulated. The insolent disregard of other peoples' rights by drivers of trucks is an early indication that they are beginning to take the same attitude toward the public as that of the railroads in the days before the people rose in their majesty and demanded their rights.

Not only should motor truck interests formulate without delay a definite legislative program upon which they can stand honestly after giving full consideration to all the interests involved, but they should stamp out definitely and finally the practices which are building up ill-will and which would lead ultimately to entanglement in a network of regulations such as now binds the railroads.

J. D.

Demand Cuts Period for Figuring Stock

Plants to Operate with Little Interruption in Activities Over Holidays

NEW YORK, Dec. 26—Evidence that the automotive industry is operating under high pressure of orders is given in the advices that few of the major automobile producing plants will direct a complete cessation of manufacturing activities during the annual inventory taking period. Some of the factories may shut down for a brief time after the first of the year, but the majority will take stock while operations continue, although on a necessarily reduced schedule.

Good Current Demand

This situation results not only from the exceptionally good current demand but for the reason that the shortage of closed car bodies has resulted in the accumulation of back orders in the hands of the car manufacturer. Some plants in the last few weeks have been forced to a modification of their daily programs because of the body scarcity.

Body producing plants still find their facilities inadequate to meet the unprecedented volume of business at this season of the year, and even with builders working at capacity, no prompt delivery of finished products is possible. Stocking of open cars, chiefly for spring demand, is proceeding slowly.

The unusually heavy winter business is attributed principally to the popularity of the closed car; but a factor less important, but still to be considered, is the success with which the so-called sport model is meeting. Manufacturers have been expanding their schedules gradually to provide for a larger percentage of production of this type.

Deliveries Still Behind

The arrival of real winter weather in the Detroit zone added to the transportation difficulties, both as to finished cars and materials. Deliveries of cars are still far behind.

Reports point to continued activity among the parts makers during the first quarter of the new year. While a few plants at this time are not operating at capacity, the majority have sufficient business to keep them at top speed production. This is one of the surprising features of December conditions, especially in view of the fact that October and November were two remarkably good months. Car manu-

Business in Brief

NEW YORK, Dec. 28—The past week was marked by generally heightened activity in practically all lines. Retail buying exceeded all yearly records since 1909. Many basic industries which normally experience quiet at this time of the year have received orders which will keep them occupied steadily.

Pig iron activity continues at many points and steel orders are coming in from implement and motor vehicle manufacturers.

Orders for railroad equipment developed materially so that actual car purchases for the year exceed a total of 154,000.

Exports for November aggregated \$383,000,000, a figure not reached since March, 1921. This increase was probably due in a large measure to exports of agricultural products.

Car loadings for the week ending Dec. 9 were 74,609 larger than for the previous week and reached 919,828. The demand for freight cars in excess of supply was reduced slightly but continued high.

Anthracite production made an estimated gain of 162,000 tons while soft coal output fell off some 489,000 tons due to lay-off for election at the mines. More eager coal buying is noted.

Class 1 railroads showed larger gross earnings for the month of October than at any time since Dec., 1920. Net operating income was the largest since October of last year.

Building continues active with resultant higher prices and demand for materials. Sales of structural material for eleven months is estimated at 1,460,000 tons.

Stocks showed a weakness early in week but rallied sharply. Bond trading was generally dull and in small quantities. Bank clearings for week ending Dec. 21 aggregated \$7,831,613,000, a gain of 17.5 per cent over the previous week. The pound sterling suffered a slight decline, a reaction to be expected after its great rise.

facturers are increasing their orders to the extent that parts makers will be compelled to operate at high pressure to meet them.

(Continued on page 1302)

NO CLOSING FOR SPICER

POTTSTOWN, PA., Dec. 23—The local plant of the Spicer Manufacturing Co., because of improved conditions, will be kept in continuous operation until further notice, it is announced.

Ford Will Construct Plant Near Chicago

To Cost \$6,000,000—First Step in Vast Industrial Expansion Program

DETROIT, Dec. 22—Ford Motor Co. has announced its intention of building a \$6,000,000 plant at Hegewisch, near Chicago, on the Calumet River and Nickel Plate Railroad. It will be composed of four units, each costing \$1,500,000. The first will be in operation by next May. Sixteen thousand men will be employed at the start, according to present plans of Ford officials.

The plant will be used for the additional assembly of Ford cars in the Chicago district and, to a large extent, for the assembly of knock-down bodies for the six car assembly plants in that territory. It will be one of a group located at several points in the country for the assembly of closed bodies from parts cut and manufactured at the Ford woodcutting and metal stamping plants. These bodies in turn will be shipped to the car assembly plants.

Ford officials state that the erection of the plant is the first step in a program of expansion which, when completed, will prove to be an almost unprecedented industrial development. The program includes the building of plants at New Orleans and St. Louis and water power development at St. Paul. There is no intention of withdrawing from Detroit, Ford's idea being to make that city the hub of a great wheel of industry that he hopes will take in eventually many cities in the country.

Stockholders Subscribe \$150,000 to Elgin Fund

CHICAGO, Dec. 26—Plans to reorganize the Elgin Motor Corp. now in the hands of a receiver and resume the manufacture of cars were discussed at a meeting of creditors with the referee in bankruptcy and representatives of the stockholders.

It was announced that stockholders have subscribed \$150,000 toward a fund to be used in getting the company out of its difficulties. It was suggested that this money be used to resume operations at once. The company's liabilities are \$833,649 and its assets approximate \$400,000.

UNION TRUCK PROPERTY SOLD

DETROIT, Dec. 23—The property of the Union Truck Co., Bay City, has been purchased by Howard P. Woodworth and associates, interested in the reorganization of the company, at a price that will pay common creditors the remaining 65 per cent on their claims spread over a period of five years. Plans are under way for an immediate resumption of manufacturing.

Body Builders Work With Little Let-Up

Plants in Milwaukee Operate at
Top Speed—Production Advances on Open Models

MILWAUKEE, Dec. 26—More regular employees are at work in Milwaukee automotive industrial shops this week than probably ever before in the period between the holidays. Ordinarily the lay-off for the year-end begins on the day before Christmas and sometimes does not end until Jan. 8, the extra week being for inventories; but this year most shops are too busy for the customary extended recess.

Body shops are especially busy, and the local plants specializing in closed types are working at top speed, with only brief interruptions over Christmas and New Year's Day. Very little is going into stock, as most shops are not yet caught up with current orders. On open types of bodies, production is going forward, too, but the main effort is to satisfy shipping instructions on coupe and sedan bodies.

Liberal Advance Orders

Advance orders for passenger car units, including engines, frames, axles, gears, etc., held by Milwaukee manufacturers, are liberal, and while shipments this week are expected to aggregate rather light, and will be next week as well, instructions are expected which will mean a resumption of heavy deliveries about Jan. 8 to Jan. 10.

The automotive industries are still among the principal customers of local manufacturers of metal working machinery. It is reported that one of the largest single purchases of milling machines on record in 1922 is that booked a week or ten days ago by a large Milwaukee machine-tool concern. The order is said to number about 25 or 30 machines, largely standard types, and came from the Ford interests.

Conditions in Retail Trade

Talks with prospects by dealers in the Milwaukee buying territory reveal a certain degree of confusion of mind regarding the price situation. Due to further reductions by some makers and a tendency among dealers to stress "reduced prices" in advertisements of certain makes, the majority of prospects feel that they will be able to save money by waiting until spring. On the other hand, some good sales are reported by the convincing argument that there is every reason to believe that prices of passenger cars on Jan. 1, 1923, probably will stand as the low record for a year or two.

Used cars are moving very slowly, despite the low prices at which they are being offered to buyers. At the same time dealers have made sharp cuts in their allowances on trade deals. Many people who want new cars next spring

Motor Vehicle Should Bear Just Burden of Taxes But Only for Maintenance of Highways

By ROY D. CHAPIN,

President of the Hudson Motor Car Co.

Detroit, December 27.

FOR the first time in its history the automotive industry is facing an organized effort to set up obstacles in the form of legislation and taxation which are designed to reduce greatly the popularity and usage of motor driven vehicles as transportation for passengers and freight. This effort will make itself felt this spring in more than forty legislatures. In each there will be a discussion of taxation and regulation of motor vehicles. Through the activity of persons whose interests are foreign to those of the motor car user efforts will be made to place new taxes and restrictions which will impose a serious handicap upon the development of highway transport.

Though the attack will be made directly against the motor truck, the passenger car will also be affected by many of the proposed measures, particularly with regard to increased taxation.

The automotive industry takes the position that the motor car should pay its own way and we want it to. Rather than escape its proper share of burden, it should be urged that in each State the motor vehicle taxes levied be sufficient and at the same time fair. When taxation and regulation reach the point where they are unfair they will not only impose a severe hardship upon the free development of highway transport but will defeat their own avowed purpose of raising more money for the highways by automatically reducing the number of taxpayers.

For years our industry has been built up because of the popular service it gives in producing a new means of transportation. At prices existing today the motor car is within the reach of almost every grown person in America and they are entitled to operate them upon the highways of the country without the imposition of unfair taxes or regulations.

There is a wide divergence in motor car taxes in the various states—some being high today and others plainly too low. The industry should help any State bring the basis of taxation to a point where it will be adequate to provide funds for the proper maintenance of its highways, the only purpose for which money derived from motor vehicle taxes should ever be used. Whether these taxes are raised directly on the motor vehicle or as a gasoline tax is not particularly material.

To insure proper expenditure of the funds a highway budget should be prepared annually in advance by the state highway department so that it can be known accurately how much money must be raised. Taken by and large throughout the country the best results are obtained if these funds were expended by the state highway department.

Prohibitive tax rates in Europe have driven the motor vehicles from the highways, and consequently decreased the efficiency of the people. England and France are now preparing to derive more money from automobile taxation by decreasing the rates and thus increasing ownership by such a figure that it will increase the total payment. The industry in this country cannot afford to neglect the experiences abroad and though the situation is not analogous there is a similarity in the conditions.

are placing their used cars with dealers now, not caring to operate them under the extreme conditions which winter has already brought. This has inflated the supply of used cars, already large.

DORRIS RE-ELECTS OFFICERS

ST. LOUIS, Dec. 27—The stockholders of the Dorris Motor Car Co. re-elected the old directors and officers at the annual stockholders' meeting. George P. Dorris is president and chief engineer; Frank C. Thompson, vice president, and J. F. Culver, general manager and secretary-treasurer. Re-elections to the board of directors included George P. Dorris, Frank C. Thompson, H. B. Krenning, George C. Griffith, Parker H. Woods, Judge Jesse McDonald and B. E. Chapelow.

1923 Franklin Schedule Calls for 50 Cars Daily

SYRACUSE, Dec. 27—The production schedule of the H. H. Franklin Manufacturing Co. for 1923 calls for 50 cars a day, according to William Dunk, production manager. If this schedule is carried out, it will prove the biggest in the history of the company. During the first quarter, Dunk states, it is expected that 3523 cars will be built at the plant in this city.

It is also announced that the local plant will not close down for the usual 10-day inventory period. The heavy demand for cars and the fact that shipments of bodies are more nearly normal is given as the reason for the omission of the inventory shutdown.

Committee Directs Service Truck Plan

**Creditors, Reorganizing Company,
Appoint Paul Moore as
General Manager**

CHICAGO, Dec. 27—Reorganization of the Service Motor Truck Co. of Wabash, Ind., is under way under the direction of a committee of creditors which has placed Paul Moore, formerly director of sales, in charge as general manager. Moie Cook has resigned as secretary to become associated with the Indiana Truck Motor Co., in which he has acquired a substantial interest.

Pending the reorganization, the Service company is operating in the usual manner and, according to members of the committee, is receiving an increasing number of orders. Especially good business is developing in the sale of gasoline driven railway cars, which have recently been developed by the company. The company now has cars of its make in operation on more than 10 railroads.

Members of the creditors committee are George P. Steele, Union Trust Co., Cleveland; Ralph Van Vechten, Continental and Commercial National Bank, Chicago, and Charles W. Folds of Hathaway, Smith, Folds & Co., representing the bank creditors, and C. W. Dickerson of the Timken-Detroit Axle Corp. and H. M. Sloan of the Buda Co., representing merchandise creditors.

Assets Exceeded Liabilities

On Nov. 1 last, the assets of the company aggregated \$5,389,003 and the indebtedness was \$2,293,984. Of this indebtedness, \$1,699,095 was owing to bankers and \$299,489 to merchandise creditors. Miscellaneous debts were \$295,399. The outstanding capital stock issued and subscribed amounts to \$2,796,438.

The reorganization plan provides for the formation of a new corporation to which all the liquid assets of the old company would be transferred. In payment, the new corporation would give to the old its entire capital stock to be held for the benefit of all the creditors. The old company would, therefore, receive all the profits of the business for the purpose of paying creditors.

WOULD LIMIT TRAILER USE

PHILADELPHIA, Dec. 27—An effort to bar all motor truck trailers from the streets of Philadelphia will be made at the next meeting of the Legislature, according to Coroner Knight. The coroner is convinced that truck trailers are dangerous because, he says, "they swing all over the street when being drawn."

WILLIAM E. CAIRNS DEAD

DETROIT, Dec. 23—William E. Cairns, formerly a development engineer with Cadillac Motor Car Co. and the Detroit

Pressed Steel Co., died at St. Petersburg, Fla., according to a dispatch received here this week. For years Cairns was a prominent engineer in the industry, his research work in pressed steel winning him wide recognition.

He learned the trade of toolmaker with William Smith, chief development engineer of Ford Motor Co., and at different times was in the organizations of the John R. Keim Co., Buffalo; Parish, Bingham & Co., Cleveland, and the Cadillac and Detroit Pressed Steel companies.

Hendee Buys Back Harley for Amount of Mortgage

SPRINGFIELD, MASS., Dec. 27—The Harley Co.'s plant was sold on foreclosure proceedings Saturday to its former owner, the Hendee Manufacturing Co., for the amount of the mortgage, \$625,000. This property, with stock and equipment, was bought from the Hendee company a year ago for \$1,100,000, subject to a mortgage of \$725,000, which was subsequently reduced to \$625,000.

Henry H. Skinner, president of Hendee, states that no interest had been paid on the mortgage but that the trustees of the Harley company had enough money to cover the taxes. He said that no plan for the operation of the plant had yet been formed.

It is reported that the plant may be opened in about six weeks, the drop forging department for the purpose of making forgings for "Indian" motorcycle parts, and the foundry department as a separate division under its own management for the manufacture of automobile parts and various metal castings.

Receivers Try to Collect from Purchasers of Stock

DECATUR, ILL., Dec. 27—Efforts are being made by the receivers of the Pan-American Motors Corp. to collect money due from persons who subscribed for stock but who failed to pay. Purchasers of common stock owe \$40,000, and it is expected that they will not receive more than ten cents on the dollar when the final settlement is made.

The law holds that such stock subscriptions are legitimate debts and must be paid, regardless of the fallen value of the stock. It is not known when the affairs of the company will be settled. The process of adjustment is slow, due to the difficulty in making collections.

CHAIN OF TIRE STORES

CHICAGO, Dec. 26—Carlsten-Williams Co., tire jobber, announces the establishment of a national chain of tire stores operating under the name of C-W Tire Stores. Each operator will own his own establishment and retain all profits from it. Behind the plan is a scientific sales and advertising service arrangement conducted by the Carlsten-Williams company.

New Plants Acquired by Springfield Body

**One Located in New Jersey, the
Other in Detroit—17,500
Annual Capacity**

NEW YORK, Dec. 26—The recently formed Springfield Body Corp. has entered into a contract for the purchase of a plant in Northern New Jersey with a capacity of from 5000 to 7500 custom jobs yearly, and has secured an option on another plant in the Detroit district with an annual capacity of 10,000 bodies.

The plant in New Jersey is within one hour of New York, occupies 14 acres and has 175,000 sq. ft. of floor space. It will be equipped, manned and in production by early spring. July 1 next is the date set for starting operations in the Detroit district plant, which has 283,000 sq. ft. of floor space.

Five acres adjoining the Springfield plant have been purchased, and buildings will be erected at once, permitting the capacity of this unit to be doubled.

Officers elected at a meeting of the corporation are: Clarence S. Dame, president and treasurer; Arthur H. Wolfe, vice-president, and Frank M. Livingstone, assistant treasurer and secretary. Dame and Wolfe formerly were president and vice-president respectively of the Smith-Springfield Body Co., whose plant at Springfield, Mass., was the first unit acquired by the new organization.

The fiscal agents of the corporation, which has 50,000 shares of class A common stock and 50,000 shares of ordinary common stock, are Chester B. Cook & Co., New York, while the banks are the Gotham National Bank, New York, and the Chicopee National Bank, Springfield, Mass.

Mestre & Blatgé Suffers Big Loss in Paris Fire

PARIS, Dec. 8—(by mail)—Damage to the extent of 2,000,000 francs was caused by a fire which broke out in the Mestre & Blatgé automobile supply stores, Avenue de la Grande Armée, Paris, yesterday afternoon. The fire was discovered when the staff returned after the midday meal, and is believed to have been caused by the explosion of an acetylene bottle near a heating apparatus. The entire Paris fire brigade was soon on the spot, but within an hour the roof fell in. Two hours later the firemen had control of the outbreak.

The Mestre & Blatgé Co. is the biggest automobile accessory firm in France. It is both a manufacturing and a selling organization, doing wholesale and retail business. The building destroyed by fire was completed only a few months ago. When the fire was at its height, the surrounding buildings were cleared. Among those turned out was the French branch of the Hartford Shock Absorber Co.

Durant Takes Stock, Closing Some Plants

Leaside, Lansing and Muncie Shut Down—Long Island and Cali- fornia Operate

NEW YORK, Dec. 26—Durant factories at Leaside, Lansing and Muncie closed last Saturday for inventory taking and will not resume operations until Jan. 2. Long Island and California plants are taking inventory, but without halting manufacturing operations. The Mason plant at Flint also is taking account of stock without a shutdown, while Locomobile will inventory during the first ten days of February.

All Durant plants have had an exceedingly busy December. The total production for the month will total 6000. Elizabeth is making preparations to start manufacturing the Durant four Jan. 2. Until the new Durant plant at Flint is completed some time in March, Long Island City will turn out 25 Durant fours a day.

The Star is moving briskly and the first of the year will find it 6000 behind schedule, the booking calling for a total of 10,000 by Jan. 1. Elizabeth is well into production with the Star and only recently the first shipment of 255 Stars, together with 50 Durant fours, was made from this factory consigned to the Harper Motor Car Co. of Washington, the city in which the Star first was shown.

The Mason plant by the end of this week will have manufactured 140 trucks this month, of which 90 were sold in the East. A production of 100 for January is planned.

Waukesha Officials Lead Discussion Before S. A. E.

MILWAUKEE, Dec. 26—One hundred ton miles per gallon of gasoline is entirely possible provided there is a proper co-ordination of the units making up the truck and the temperature of the engine is properly controlled. This is perhaps, the major thought coming out of the joint meeting held here of the Mid-West section of the Society of Automotive Engineers and the Engineers' Society of Milwaukee.

The meeting was addressed by H. L. Horning and James D. Fisher, general manager and chief engineer, respectively, of the Waukesha Motor Co. The topic chosen was "One Hundred Ton Miles Per Gallon of Gasoline." This did not represent a "stunt test," but rather a definite practical accomplishment by the Waukesha Motor Co. in connection with experiments conducted with a 2½-ton truck.

During the course of the meeting, Horning stated that the knock or "Ping" absolutely controls the output of the engine. He also mentioned that the whole problem of efficiency and getting economical performance is in keeping the

temperature of the engine within certain limits. Aluminum pistons, he stated, are far superior in this respect to iron pistons.

He also emphasized and dwelt at some length on the statement made by Fisher that efficiency cannot be obtained by the truck makers getting some good units and some bad units and then attempting to fit them together. Guests at the meeting were taken on a tour of inspection through the A. O. Smith, Nash, Seaman Body Corp. and Harley-Davidson plants.

Ford Urges Orders Now To Avoid Delay Later

DETROIT, Dec. 23—Ford Motor Co.'s Highland Park plant will be closed from Dec. 27 to Jan. 2 for inventory, the period having been shortened from the usual holiday week because of the pressure of business. Inventory in the assembly branches will be taken in the shortest time possible at the same season.

National advertisements are being run by the company, bearing its signature, advising all persons who contemplate buying a Ford car in the spring to get in touch with their nearest Ford dealer at once, to avoid a long delivery delay later.

France and Canada Sign New Commercial Treaty

WASHINGTON, Dec. 27—Automobiles are among the principal products on which France will enjoy more favorable concessions in the Canadian market than does the United States as the result of a new commercial treaty signed by representatives of the French and Canadian governments at Paris on Dec. 15.

The treaty provides that Canadian products are to enjoy the minimum rates of the French tariff on 120 important items and the intermediate rate on 400, with the understanding that all other articles are to receive the same rate as is now, or may at any later time, be granted to the United States.

In return, Canada grants to the products of France and the French colonies and possessions the intermediate rates of the Canadian tariff with an assurance of treatment equal to that which may be granted to the most-favored nation, except Great Britain and the Dominions, which enjoy the British preferential or minimum rates of the Canadian tariff.

FOREIGN TRADE MEETING

NEW YORK, Dec. 27—The annual convention of the National Foreign Trade Council will be held in 1923 at New Orleans, the dates having been fixed as April 25, 26 and 27, according to an announcement by O. K. Davis, the secretary. As at former conventions, a large representation of automotive representatives are expected in attendance, and it was stated that convention delegates might well link up attendance at the New Orleans meeting with business trips to Mexico and Cuba.

English Maker Sees American Invasion

Sir Herbert Austin Says "Satura- tion Point" Will Soon Be Reached Here

BIRMINGHAM, ENGLAND, Dec. 16 (by mail)—The American automobile industry, in the eyes of Sir Herbert Austin of Austin Motors, Limited, manufacturer of automobiles in this city, must soon curtail production because of the "fact that it will soon be impossible to find a new customer in the United States."

This observation is made by the British producer following a five months' tour of the United States, investigating automobile plants in Detroit and elsewhere. Following his tour, Sir Herbert has the following to say in comparing American production methods with those of the British:

The total number of cars in the world is about 12,000,000. In the United States alone there are 10,500,000, leaving 1,500,000 for the rest of the world. Shortly it will be impossible to find a new customer in the United States, and the only cars sold there will be to replace worn out vehicles. What does this portend? Is it conceivable that factories laid down to produce 5000 cars a day will curtail their production and shut down the greatest production?

That is not possible, but what they will do will be to exploit other countries, including England.

Says British Car Is Superior

It must be admitted that the United States manufacturers can build a cheap car, if they desired, but the American car can never equal that of the British in value or workmanship. For the additional price paid for the home product a corresponding extra value is secured, which is not the case with the American built car.

English automobile manufacturers are warned, however, that it will be necessary to bring down the prices in England as low as possible without reducing value, in order to meet the competition from the United States that must of necessity result when the American customer is a scarcity. This should be the aim of home manufacturers in the production of both private and commercial vehicles.

Sir Herbert also states that he was impressed with the full time employment of labor in the United States as contrasted with that of England, where there is still much unemployment. He is of the opinion that there are some concessions yet to be made by the British laboring man in his dealing with manufacturers before American competition can be met.

TRACTORS IN PENNSYLVANIA

PHILADELPHIA, Dec. 19—The number of farm tractors in use in the State of Pennsylvania is approximately 12,125 as against 8500 one year ago, according to a report of the state Department of Agriculture. In 741 townships alone, 5782 farm tractors are reported.

Durant's Flint Car Has First Showing

Engine of New 6-Cylinder Addition Has Engine with 7-Bearing Crankshaft

NEW YORK, Dec. 26—The Flint, a development of the Chrysler Six which was taken into the Durant family some time ago, made its bow this week. It was a private view, the official debut being scheduled during the New York show when the Flint will be on display at the Hotel Commodore. This Commodore showing will be the only appearance of the Flint on the show circuit until well into March. There will be four or five different body styles in the exhibit.

The formal announcement of the Flint now gives Durant a most complete line, including the Star, Durant four, Flint, Durant six and Locomobile, in the price order named as well as the Mason Road King in the truck field. The Flint will be manufactured at Flint, Mich.

The Flint will be sold as a 5-passenger open car at \$1,195, a 4-passenger coupe at \$1,895 and a 5-passenger sedan at \$1,985. It is designed as a high powered six at a moderate price, with conventional engineering features throughout. If there is anything unconventional in the make-up of the chassis it is the fact that the engine has a 7-bearing crankshaft, practically all other low priced sixes having either three or four-bearing crankshafts.

The cylinder size is 3½ by 5 in., giving a piston displacement of 268 cu. in. On test the engine is said to have developed a torque of 170 lb.-ft. at 800 r.p.m. and an output of 70 hp. at 2500 r.p.m. The engine is built by the Continental Motors Corp. but is of special design for this car.

All six cylinders and the major portion of the crankcase are in a single casting, to which the head casting and the aluminum oil pan are secured by bolts. The pistons are of cast iron with three rings each. The usual drop forged connecting rods are used, 10½ in. long between

centers, with a bronze bushing for the piston pin. The big ends are tinned and have the bearing metal cast into them. The crankshaft is of 2 in. diameter at both the crankpins and the main bearings.

Fuel is fed from a 20 gal. tank at the rear through the Stewart vacuum system to the Stromberg 1¼-in. carburetor which is bolted to a hot-spot manifold. Ignition is by the battery system, the whole electrical equipment being of Auto-Lite design and make. The ignition coil is mounted on the cylinder block adjacent to the distributor, which makes for shortness of wiring, while the high tension cables to the spark plugs are carried in a steel tube over the engine.

The starter drives through a Bendix drive to the exposed flywheel. It is located on the right-hand side of the engine, with the generator almost directly above it. The latter is driven through the pump. The so-called front end drive is by a Morse silent chain of ½-in. pitch and 1½-in. width. The drive is of the triangular type, and provision for taking up wear in the chain is made by arranging the front bearing and the pump so they can be slid outward and secured in place by means of screws. The generator is driven through a long shaft with two flexible couplings of the hose pipe type. The battery is of USL make and has a capacity of 120 amp.-hours.

Lubrication Arrangement

Lubrication is by force feed to the main and connecting rod bearings, the oil being circulated by means of a gear type pump driven off the accessories shaft. An oil gage on the dash indicates the pressure on the oil. The radiator is of the cellular type (Fedders) and a thermostat is built into the return pipe on top of the engine. The four blade 16-in. fan is driven from the crankshaft through a ⅝-in. V-belt.

The engine has four point support on a tubular sub-frame consisting of 2½-in. steel tubes welded into the front and center cross members of the frame. These tubular sub-frame members carry out the Durant idea of adding to the rigidity of the frame by longitudinal tubular members. This keeps the main

(Continued on page 1305)

Aims to Standardize Financing of Sales

Association in Chicago Defines Restrictions Governing Time Payments

CHICAGO, Dec. 27—A move toward standardization of practices in the financing of retail sales of automobiles on the deferred payment plan has been made by the Central Auto Finance Association, with headquarters in Chicago, which is preparing to send out to the trade a circular defining certain conditions and restrictions which are to be observed.

The circular sets forth the following conditions:

For new passenger cars, open and closed, notes are to have a maximum maturity of 12 equal monthly payments.

For used passenger cars, open and closed, the minimum down payment must be 50 per cent of the time price and notes are to have a maximum maturity of 10 equal monthly payments.

Cars sold as demonstrating cars, because of insurance restrictions, will be treated as used cars and are subject to the used car terms and rates.

The financing of used cars will be restricted to cars not more than four years old, as per conference insurance rulings.

No deals involving hold-outs, reserves or infractions of the foregoing, can be accepted.

The circular emphasizes the statement that the monthly payments must be equal and, from members of the association, it is learned that the reason for this is that in a good many cases where payments of the balance in 12 equal monthly installments would require a monthly sum beyond the means of the buyer it has been the practice to accept 11 small notes with a large one at the end. This practice is frowned upon by the association as a poor business method.

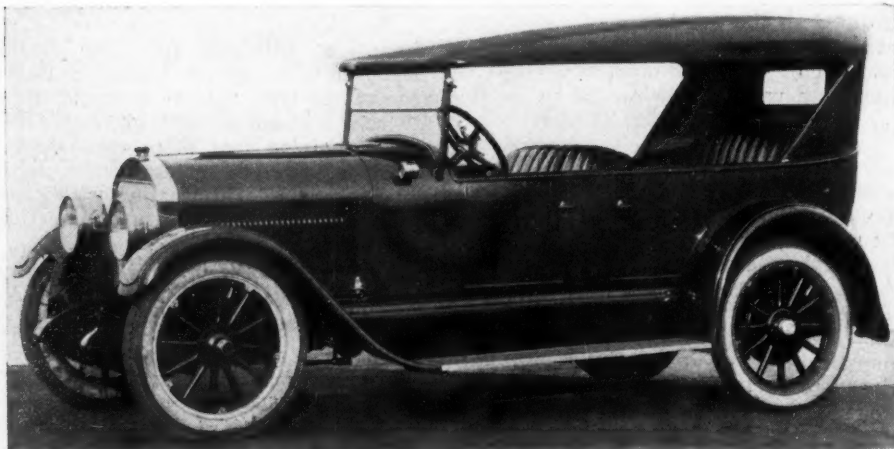
Although the circular does not state a minimum down payment on new cars, the members of the association generally require not less than one-third of the time price.

EDWARDS TO MAKE RAIL CAR

SANFORD, N. C., Dec. 26—The Edwards Railway Motor Car Co. announces that practically all of the \$200,000 stock of the company has been disposed of and that preparations are being made to start manufacture here at an early date. Officials state that enough orders are in hand to insure operation of the plant for some months.

WARREN A. MYERS DEAD

SPRINGFIELD, OHIO, Dec. 26—Warren A. Myers, secretary-treasurer of the Robbins & Myers Co., manufacturer of electrical equipment, died yesterday of heart disease after a lengthy illness. In addition to his connection with the Robbins & Myers Co., he was a banker and former publisher of a Springfield daily newspaper.



New Flint five-passenger open car priced at \$1,195

Liability Insurance May Be Compulsory

Legislatures Expected to Take Up
This Question at Approaching
Sessions Next Year

NEW YORK, Dec. 26—Compulsory insurance, it is believed will be one of the phases of automobile legislation that will be attempted next year when 43 State legislatures meet. Many signs point to this, and in at least four of the commonwealths steps have been taken in that direction. While it is not definitely known, it is thought that there are others which are waiting only for some State to take the lead before bringing up the subject.

New York, Pennsylvania and Massachusetts already have gone into the question deeply, while another State, Nebraska, has indicated that it is gathering data that can be used as a basis for a bill. Massachusetts has taken definite action through the filing of a measure by Senator-elect Abbott B. Rice to require general liability insurance of motor vehicle owners.

Follows New York Measure

The Massachusetts bill is patterned after a New York measure fathered by State Senator S. W. Straus, Jr., and drafted by Miles Dawson, who wrote the workmen's compensation act. It provides that a person injured by an automobile or his dependents will be entitled to receive indemnity from the State fund, whether the car is registered in Massachusetts or in another State, while Massachusetts owners will be insured against liability arising from accidents occurring in the Bay State, as well as in any other State which enacts a similar law.

The amounts of the indemnity have a basis similar to that of the workmen's compensation law. The maximum for death is \$6,400 and for incapacity \$4,000, while the minimum payments specified are \$1,000 for death, \$8 a week for total incapacity and \$5 a week for partial incapacity, besides medical attendance and certain specified sums for loss of limb. It is further provided that an injured person or his dependents will receive weekly payments unless the board deems it advisable to pay a lump sum, and he cannot assign the payment nor can it be attached for debt.

Can Sue Owner for Damages

The bill also provides that, if an injured person desires to sue the owner for damages rather than accept indemnity from the State fund, he is free to do so, in which case the State fund will pay to the owner of the car the amount which the injured person is entitled to under the act. Should an owner prefer to furnish a bond, he may do so and may also insure additionally in any insurance company.

MICHIGAN CITY TESTS POSSIBILITIES OF BUS

DETROIT, Dec. 23—City officials of Kalamazoo are testing out the possibilities of bus transportation in that city, preliminary to deciding upon the future transportation system. Serious consideration is being given to replacing the present trolley system of the Michigan United Railways with buses, the franchise of the traction company expiring Feb. 13. The commission has rejected a new 30-year franchise proposed.

Under the new franchise fares would be increased from eight to ten cents and provision would be made for bus lines as feeders to the trolley system. The franchise also gives the M. U. R. first opportunity to adopt an all-bus system in the event of street cars becoming obsolete within the lifetime of the franchise.

A special election will be held Jan. 30, at which the voters will determine whether a municipal bus system is to be inaugurated. A tentative contract for 30 buses, subject to confirmation at the election, will be signed within a few days. The total cost of the municipal bus plan would not exceed \$175,000, proponents declared.

New York, it is said, has two forms of compulsory insurance coming up, one along the lines of the Massachusetts plan and the other an indemnity bond. The latter is criticized because private companies would handle the business and it would be necessary for the insurance applicant to show assets before he could get the bond. With compulsory insurance of the other sort an injured person could collect either through the compensation plan or could sue separately under his common law rights, which could not be taken away from him by any such legislation. It is figured that this sort of a law would be inadequate in that it would not offer sufficient coverage to the insured, and that it would be necessary to take out additional liability insurance.

In the expectation that legislation of this sort will be attempted considerable thought is being given to the subject by those identified with the automotive industry.

RECEIVER TAKES BURDICK TIRE

NOBLESVILLE, IND., Dec. 27—Charles W. Jordan, president of the American Trust and Savings Bank of Richmond, Ind., which was appointed receiver of the Burdick Tire & Rubber, has taken charge of the company's plant which has never been operated since it occupied its new building two years ago.

The concern is a \$5,000,000 corporation.

1922 Road Building Will Break Records

During Year Work on 17,716
Miles of Federal Aid High-
ways Was Completed

WASHINGTON, Dec. 27—Federal highway construction in the United States for the year 1922 will break all records for road construction, according to estimates of the Bureau of Public Roads. During the year construction of slightly more than 10,000 miles of Federal-aid roads and more than an equal mileage of State highways without Federal assistance was started and completed.

The figures show that there were 17,716 miles of Federal-aid highways completed during the year with 14,513 miles still under construction. In other words, 7716 miles of roads begun in 1921 were completed, 10,000 were begun and completed and 14,513 miles of highway started, which will be completed in 1923. The total length of projects in all stages, including those which have been completed and those which are in the stages of preliminary construction, is 39,940 miles.

The roads brought to completion during the year average over 200 miles for each State. The greatest increase in complete mileage is in Texas, which during the year has added 933 miles to its complete highway system. Arkansas, Georgia, Iowa, Minnesota and North Carolina each reported an increase of more than 500 miles, and Montana and Wisconsin of greater than 400 miles.

Aeromarine Transported 9167 Passengers in Year

NEW YORK, Dec. 26—Aeromarine Airways, Inc., reports that during the year ending Nov. 1 it carried 9167 passengers and that it had transported more than 20,000 in the past two years without accident.

It has three divisions. In the Great Lakes division, where a daily service between Cleveland and Detroit, is maintained, 412,854 passenger miles were flown in 574 flights and 4388 passengers carried. In 744 flights 2399 passengers were carried by the Key West-Havana, Miami-Bimini and Nassau-Palm Beach division. In the New York division there were 807 flights, during which 57,658 miles were flown and 2380 passengers carried.

FORD TRACTOR PLANT STARTED

WALKERVILLE, ONT., Dec. 27—The Ford Motor Co. has commenced operations on the construction of part of its new building. When this portion is finished it is the intention of the management to proceed with the manufacture of tractors.

Sales in California 48 Per Cent Greater

November Shows Big Increase
Over Record Established by
Month Last Year

SAN FRANCISCO, Dec. 27—Sales of automotive vehicles, both passenger cars and trucks, were greater by 48 per cent throughout California in November, 1922, than they were in the same month of 1921, which, up to this year, had been the record November of the industry in this State, according to figures published by Motor Registration News of Oakland, which collects each month a record of the sales of the entire State.

One of the unusual facts brought out by these statistics is that sales were uniform all over the State, that is to say, the proportionate increase was as great in the smaller cities as in the larger. The month—which is never an especially good sales month on this coast—shows by the business done, and by the steady increase day by day from the first to the thirtieth, that the entire automotive merchandising industry is on the upgrade in all parts of the State. Total sales of passenger cars and trucks for November, 1922, were 17,365, as compared with 11,658, for November, 1921, an increase of 5707 vehicles.

Truck Sales Increased

Of this total for the month just closed, 15,604 were passenger cars, compared with 10,424 in November, 1921, an increase of 49 per cent for the passenger cars. Of trucks, 1761 were sold in November, 1922, as compared with 1234 a year ago, an increase of 520, or 42 per cent. Northern California dealers sold 6268 passenger cars in November, 1922, as against 4299 in the same month a year ago; while southern California dealers sold 9336 passenger cars in November this year and 6124 a year ago. Northern dealers, however, sold 278 more trucks this November than last, while the southern dealers sold only 249 more for the month just closed.

Los Angeles County led all the other counties with a record of 6761 sales in November, 1922, an increase of 2443, or 56 per cent, over November, 1921. Los Angeles County also sold 202 more cars than the total of the next fourteen largest counties in the State combined. The largest percentage gain was registered by San Diego County whose dealers sold 639 cars in November, 1922, as compared with 348 in November, 1921, a gain of 83 per cent. Alameda County showed an 82 per cent gain.

Detroit Sales Decline

DETROIT, Dec. 27—Retail sales of new cars in the city of Detroit in November totaled 2099, of which 845 were open and 1254 closed, with sales of new trucks in all classes aggregating 278. October new car sales were 1464 open and 1525

IMPLEMENT DEALERS PREDICT GOOD YEAR

MILWAUKEE, Dec. 27—Question box discussions at the annual meeting of farm machinery dealers of Wisconsin in Milwaukee developed that most of the dealers look for considerable improvement in business in 1923. This was especially true of dealers in the dairying sections of the State, who said that farmers had not been as hard hit by the depression, and that recent increases in the price of milk, butter, etc., had been beneficial psychologically as well as financially.

Grain and potato growers, however, were less optimistic, dealers from these sections said. While the crops were large and of excellent quality, prices received for them were very low, besides which heavy losses were sustained, especially on potatoes, due to the breakdown of railroad transportation.

Discussing tractors specifically, dealers said that sales during the last half of 1922 were far better than the first half, although still of very limited volume. Prospects, however, were regarded as encouraging but no sharp rise in demand is looked for.

closed with 356 new truck sales. In the car sales Ford's represented about one-third of the total and in trucks about two-thirds.

These figures are now being compiled monthly by the Detroit Automobile Dealers Association through an office opened in Lansing. Under the provisions of the Condon bill, cars and trucks in Michigan are fully described when licensed which makes possible the complete recording of sales according to make.

Philadelphia Demand Continues

PHILADELPHIA, Dec. 23—Automobile distributors and dealers report a continued demand for all classes of cars, with preference shown for closed models. Sales of used cars are somewhat slow, as are truck sales, though sales of truck parts are good.

Year's End Brightened in Section of Indiana

TERRE HAUTE, IND., Dec. 27—The automobile dealers in this section have had a fairly good Christmas trade to end what has been a rather disastrous year for them. The year started fairly well but the prospects were soon broken into by the probability of the mine strike.

The immediate effect of that strike was the complete demoralization of the used car market, and when the market went to pieces, the sale of new cars to others than miners went with it. With this con-

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New York Prepares for National Show

Eighty Different Makes of Cars to
Be Exhibited—Active Week
Scheduled

NEW YORK, Dec. 27—A week away from show time finds the industry keen for the national automobile show, which opens as the twenty-third annual exhibit in Grand Central Palace Jan. 6. There will be eighty different makes of passenger cars and more than 300 exhibitors of equipment in the big building.

The calendar of show events is longer than usual with big dinners for everyone and luncheons galore for the dealers.

There are to be four major banquets, the first being set for Monday night of show week, when the Rubber Association of America will entertain at the Waldorf. On Tuesday night the National Automobile Chamber of Commerce will hold its annual function at the Commodore, with Will Rogers as one of the two speakers, telling the industry "What I Think About the Automobile." The Motor and Accessory Manufacturers Association has reserved Wednesday night at the Commodore and as usual the banquet will be speechless, but the rest of the show will be most entertaining. The Society of Automotive Engineers will banquet at the Pennsylvania on Thursday night.

S. A. E. Annual Meeting

The S. A. E. will hold its annual meeting during show week, inducting into office its new officials and discussing subjects of interest to the engineer. The M. A. M. A. also holds its annual meeting during the week. An added feature is to be the special meeting of the truck members of the National Automobile Chamber of Commerce, set for Thursday, Jan. 11, the whole day being given over to a discussion of matters in which the truck manufacturers are particularly interested.

As usual the hotels will house a number of cars which have been unable to get in the Palace. There will be such displays at the Commodore, Astor and one or two other places, and in addition there will be a sort of an overflow in Madison Square Garden, the former home of the national shows. The Garden affair is promoted by William H. Wellman and the display will include several foreign cars, two or three American trucks and several exhibits of taxicabs, as well as automotive equipment.

Body Builders' Show

Still another feature is the annual show of the Automobile Body Builders Association at the Twelfth Regiment Armory. It will open Monday night, Jan. 8, and last throughout the week.

The show in the Palace will not introduce many new makes of cars. Of the few new comers the Star and Climber

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Men of the Industry and What They Are Doing

Bill Manages Owen-Dyneto

Harry L. Bill, who has been in charge of Saxon since the retirement of President Clarence Pepper and who has been connected with factory management since the early days of the industry, has been appointed vice-president and general manager of the Owen-Dyneto Co. of Syracuse, N. Y., by R. M. Owen. Bill was factory manager for Winton and held similar positions with Chalmers, Springfield Metal Body Co. and the Corbin Co. when it manufactured the Corbin car.

Hanson Directs Haynes Advertising

Walter P. Hanson, who for a number of years has held the position of assistant director of advertising for the Haynes Automobile Co., has been appointed advertising manager. Ross H. Garrigus becomes assistant advertising manager under the new organization plan. Previous to his connection with the Haynes company, Hanson was engaged in newspaper work in Chicago.

Pierce-Arrow Advances Sales Heads

Laurence E. Corcoran has been named general sales manager of the Pierce-Arrow Motor Car Co. He has been associated with the Pierce-Arrow Co. for 17 years, and for the last two years has been passenger car sales manager. He will have complete direction of merchandising and distribution of both passenger cars and trucks. Immediately in charge of car selling will be Thomas J. O'Rourke as car sales manager. O'Rourke has been associated with the passenger car sales division of the company for 16 years. Robert C. Patten, who for several years has been truck sales manager, has been appointed executive in charge of the development of sales of fleets of trucks to national users.

Charles S. Shuman Resigns

Charles S. Shuman has tendered his resignation as treasurer of the Vacuum Muffler Corp. of New York and Bridgeport, to become assistant cashier of the Catawissa National Bank. He will remain on the board of directors of the Muffler Corp. E. Christophersen, president of the corporation, will take entire charge of both the executive and developing work.

Norris Made Western Manager

E. G. Norris, Seattle branch manager of the McQuay-Norris Manufacturing Co., has been appointed western manager of the company with headquarters in San Francisco. He will have jurisdiction over the sales and distribution of McQuay-Norris products in California, Oregon, Washington, Idaho, Montana, Utah, Nevada and Arizona. The position of western manager has been created for the purpose of uniting the western

States under one central department. Branch offices located in San Francisco and Seattle are not affected by the change. Norris became associated with the piston ring industry shortly after the founding of the McQuay-Norris company and has been located in Seattle for eight years.

Bartels Represents Dort

J. F. Bartels, for years affiliated with the Moline Plow Co., has joined the Dort Motor Car Co. as factory sales representative in New England, New York, Pennsylvania and Delaware. Bartels formerly was branch manager for the Moline company at Minneapolis and recently became assistant division manager of the Atlantic States division, with headquarters at Poughkeepsie. He succeeds C. R. Teaboldt, who has taken over the management of the Dort branch in New York.

Sykes With Gray Tractor

George Sykes has been appointed general manager of the Gray Tractor Co. of Minneapolis. The acquisition of Sykes will not change the personnel of the organization, J. W. Gray continuing as president, H. D. Dodge in charge of sales and George Gird as branch manager of the Wichita office. The management of the Gray Tractor Co. of Canada, Ltd., remains in the hands of Albert Prugh and James Letham.

McMillan to Take Up Financing

Thomas C. McMillan, former president of the Milwaukee Automotive Dealers Association, and one of the best known men in the passenger car trade of the Middle West, has retired as secretary-treasurer of the Overland Wisconsin Co. and affiliated concerns, to devote his entire attention to automotive financing. He has worked out a new plan of financing dealers as well as buyers.

Rowan Goes With Distributor

E. P. Rowan, formerly with the B. F. Goodrich Co., has become associated with Thomas J. Hay, Inc., Chicago, Chandler distributor for northern and central Illinois, in the capacity of manager of the wholesale department. Rowan was identified with Goodrich from 1897 to 1921 as Chicago branch manager and later district manager. In 1919 he went to Akron as sales manager for Diamond tires.

Hallett Joins G. M. Research

Major George E. A. Hallett, formerly in charge of the powerplant section of the Air Service, engineering division, at McCook Field, Dayton, Ohio, has resigned to accept a position with the General Motors Research Corp. Hallett has been actively identified with the industry since the war. His work in particular has been in the development of aircraft engines.

D. S. Campbell Resigns

D. S. Campbell, who has been associated with Tuthill Spring Co. for over 16 years, has resigned as secretary of the company. Campbell is one of the pioneers in merchandising and marketing automobile springs for replacement. He has not announced his plans for the future.

Manhattan Electrical Names Smith

K. M. Smith has been appointed general battery sales manager of the Manhattan Electrical Supply Co., Inc. He was formerly general sales manager of the Gould Storage Battery Co. During the war he served as assistant to William C. Potter, director of aircraft production.

Fitch Goes with Marmon

Charles M. Fitch, who has resigned as manager of the Falls Motors Corp., has become associated with the Nordyke & Marmon Co., as general superintendent of the body department, recently greatly enlarged.

Four Wheel Hydraulic to Exhibit New Brake

DETROIT, Dec. 26—The Four Wheel Hydraulic Brake Co. is preparing to place its new hydraulic four wheel brake upon the market and will exhibit it this year at one of the hotels during the week of the New York show. Demonstrations of the brake will be given on a standard type automobile which has been specially equipped at the Detroit factory of the brake company. The brake is patented under the name "Lockheed," a phonetic spelling of the last name of Malcolm Loughead, the inventor.

The company abandoned a plan to announce the brake earlier when it was found that a change in the detail of its construction would improve its efficiency. This has been worked out after a year's experimenting, and the brake as exhibited will represent the type to be manufactured.

Kelly Truck Receiver Will Save on Salaries

SPRINGFIELD, OHIO, Dec. 26—Pearl A. Lewis, receiver of the Kelly-Springfield Motor Truck Co., has reported to the Common Pleas Court that he will make a saving of \$36,000 a year by reducing the number of executive officers and combining the work of others.

The savings in payroll, aggregating \$3,000 a month, are being effected by the substitution of three executives drawing a total of \$1,176 a month for officers and executives receiving \$2,591 monthly and the discontinuance of eight officials drawing a total of \$2,328 a month. The receiver will receive \$500 a month.

1922 Was Best Year in Hudson History

Balance Sheet Shows Current Assets of \$15,497,577, Tripling Liabilities

DETROIT, Dec. 27—Hudson Motor Car Co., in its consolidated balance sheet as of Nov. 30, shows current assets of \$15,497,577 as against current liabilities of \$5,031,411, a ratio of three to one.

Cash on hand of \$7,236,547; sight drafts, \$2,385,802, and inventories of \$5,378,007, together with \$497,219 in accounts receivable are included in current assets.

Current liabilities embrace accounts payable of \$3,957,491, and distributors' deposits and accrued accounts of \$1,073,920. Reserve for Federal taxes in 1923 is \$1,012,200.

In a statement to stockholders, President Roy D. Chapin says that the past fiscal year had been Hudson's most successful, both with regard to earnings and to the development of the product. Sales for the year were 26,271 Hudson and 34,962 Essex, he states. Cars are being shipped to all parts of the world, with foreign shipments constantly increasing.

The list of dealers has been made much larger, the statement says, and a large demand for closed cars has been built up, thus greatly increasing sales. "We believe," Chapin states "our percentage of closed models produced this year to be the highest in the motor car industry."

Stock Offering Beneficial

Reference is made to the opening of stock in the company to public participation which, it is declared, assures an additional friendly interest for the company's product.

Plant assets are listed at \$8,828,300 after provision for depreciation. Capital stock is \$13,201,000, and the surplus is \$5,289,475. The consolidated income account shows gross profits from sales of cars and parts of \$12,631,176 which, with interest earned and other income, places the total income at \$12,948,842. Selling service, administrative general expenses and other charges against income, total \$3,339,661. Depreciation is \$1,220,387 and interest paid \$133,917. This leaves a net income transferred to surplus account of \$7,242,677.

The surplus account shows a surplus of \$10,508,287 on Dec. 1, 1921, with net income from this year making \$17,750,964, less dividends during the year of \$1,761,489, and surplus transferred to capital stock account of \$10,700,000. The surplus on Nov. 30, 1922, was \$5,289,475.

HARVESTER TRANSFERS FORCE

SPRINGFIELD, OHIO, Dec. 23—Starting Tuesday the force in the motor truck department of the Springfield works of the International Harvester Co. will be

reduced until the warehouse is cleared and there is an increased demand for light models.

The larger part of the force, according to C. H. Smart, superintendent, will be transferred to the foundries and hay press departments. The output of castings for the foundries will go to the Akron plant, which is manufacturing the heavy type of motor truck. The Springfield works has been turning out from 25 to 50 trucks daily since last January.

Demand Cuts Period for Figuring Stock

(Continued from page 1294)

A consistent gain is being shown in the truck field, with promise of more pronounced advances the early part of the new year.

Tire makers are increasing their schedules to replenish stocks that were allowed to reach low level and to prepare for spring trade. They report a greater number of orders booked for spring delivery than heretofore experienced, indicating the approach of an unusually active season.

Wills to Show New Cars at New York and Chicago

DETROIT, Dec. 27—C. H. Wills & Co. will exhibit new models at the New York and Chicago shows, in both closed and open styles. The new models involve changes in both chassis and bodies. The company has not declared whether the new models will sell at prices differing from former models in its line and is withholding all details pending the completion of the appraisal this week.

The company is planning an extensive closed car business in 1923.

Dividend of 17 Per Cent Ordered on Willys Claims

TOLEDO, Dec. 27—An additional dividend of 17 per cent on all adjudicated claims against the Willys Corp. has been ordered paid by Judge Killits in the Federal Court. The sum of \$2,498,641 is available for that purpose. Of that amount, \$243,641 is in the hands of the receivers here, \$400,000 in New Jersey and \$1,850,000 in the northern district of New York. The total approved claims to date amount to \$14,506,165.

Settlement of the claim of the Sowers Manufacturing Co. of \$943,025 for \$500,000, as suggested by interested parties, has the approval of the court here.

U. S. TIRES TO ADVANCE

NEW YORK, Dec. 28—Prices of United States tires will be advanced on Jan. 2. It is said that the increase will amount to 5 per cent on dealer business and 12 per cent on consumers'. This applies to all cords of all sizes of tubes and fabrics above 30 x 3½. Truck pneumatics and solids and small size fabrics are not affected.

G. M. C. Takes Over Brown-Lipe-Chapin

Has Held Interest in Company— Former General Manager Becomes President

NEW YORK, Dec. 28—The Brown-Lipe-Chapin Co. of Syracuse, N. Y., is now a definite unit of the General Motors Corp. through the acquisition of all outstanding stock by the G. M. C., according to an announcement made today by Pierre S. duPont, president of General Motors. At the same time it was stated that H. W. Chapin, who has been general manager since the company started business, has been elected president of the Brown-Lipe Chapin Co., succeeding Alex. T. Brown.

General Motors for some time has had a considerable interest in the company, which specializes in the manufacture of automobile differentials and gears, but did not control it. This interest is said to have been about 20 per cent. Under the new deal the G. M. C. becomes complete owner of the company.

Interest Acquired Ten Years Ago

The first interest was acquired about ten years ago, when the Weston-Mott Co. of Flint, Mich., became a G. M. C. unit. Up to 1912 General Motors owned 49 per cent of the Weston-Mott stock, with C. S. Mott owning the remaining 51 per cent. At that time Weston-Mott owned a large interest in the Brown-Lipe-Chapin Co., so that in 1912, when General Motors acquired C. S. Mott's interest in the Weston-Mott Co., the deal included the Brown-Lipe-Chapin stock.

This deal in no way involves the Brown-Lipe Gear Co., also of Syracuse, which has been closely identified with the other company. A. E. Parsons, general manager of the Brown-Lipe Gear Co., when reached at Syracuse today over the long distance telephone, declared positively that the purchase of the Brown-Lipe-Chapin stock by General Motors would have no bearing upon the Brown-Lipe Gear Co. He asserted that his company is not in any sense a subsidiary of Brown-Lipe Chapin, and that there has been no change in stock ownership in the past six years. Brown-Lipe Gear will continue to operate as an independent enterprise, Parsons said.

Incorporated in 1910

The Brown-Lipe-Chapin Co. was incorporated Feb. 2, 1910, with a capital stock of \$1,500,000 and no funded debt. Dividends ranging from 20 to 30 per cent were formerly paid. Previous to the present General Motors deal, the officers of the Syracuse concern were: Alex. T. Brown, president; A. E. Parson, vice-president; S. H. Cook, vice-president and assistant general manager, and H. W. Chapin, secretary-treasurer and general manager. The directors were Brown, Parsons, Chapin, C. S. Mott and Alfred P. Sloan, Jr.

Open Winter Makes Shipments Easier

Less Difficulty Experienced in Moving Products—Fewer Trucks Being Used

NEW YORK, Dec. 27—Thanks to the open winter and a marked improvement in the railroad situation within the last few weeks, the industry is moving its products with less difficulty than formerly. Because of the improvement in conditions automobile manufacturers are not so greatly worried about the materials situation, and not many of them are using motor trucks to get their supplies as they were doing a few weeks ago.

Reports received by James S. Marvin, head of the traffic division of the National Automobile Chamber of Commerce, show that the railroads are rapidly solving their problems and giving better service. As an indication of this improvement, the car shortage of 133,785 the last week in November had decreased to 111,961 at the end of the first week in December, and the accumulation of unmoved cars had been cut in half from the high mark of Sept. 22.

Car Loadings Keep Up

Car loadings are well maintained. The week ending Dec. 8 showed 919,828, an increase from 845,000 the week previous, of which 539,420 were merchandise and miscellaneous. No marked improvement is shown in motive power, although there is a slight decrease in locomotives requiring repairs—27.9 per cent as compared with 28.5 two weeks previous. The percentage of freight cars in bad order continues to decline and on Dec. 1 had reached 9.9 per cent as compared with 15.8 per cent a year ago.

Marvin finds that the railroads have carried a good volume of automobile freight in the year just closing. Figures he has gathered show that shipping of assembled automobiles from main factories and assembling plants during the past twelve months reached the record figure of approximately 400,000 carloads, transporting 1,700,000 motor vehicles.

Industry Advances in Shipments

Manufactured parts will amount to about 100,000 carloads, and it is not at all unlikely that this heavy shipping will place automobiles and parts third in the number of carloads of manufactured articles shipped by railroads. In 1921 it ranked fourth, being exceeded only by refined petroleum, iron and steel products and cement. Much of the refined petroleum and a considerable part of cement and iron and steel shipping, however, is the direct result of motor car manufacture and use.

The railroads, too, are reaching out for the automobile business as evidenced by the fact that 18,000 new automobile box cars have been included in railway equipment orders during the past year, which

will bring the total of such cars in service up to 111,000.

Another bit of interesting information Marvin has gleaned is that more than 750,000 motor vehicles, 30 per cent of the 1922 output, were delivered through the medium of driveaways, showing how the industry has met the transportation problem.

Duplex to Add Models and Build More Buses

DETROIT, Dec. 26—At the annual meeting of the Duplex Truck Co., President H. M. Lee declared that the disposal of thousands of trucks used in the war to States for highway building was largely responsible for the poor conditions in the truck market in the last two years. The financial statement of the company showed a deficit of \$49,386 for 1922.

To meet conditions in the truck field, the company plans to devote about 40 per cent of its facilities to the manufacture of buses, which are reported to be in big demand. The present truck line will be increased by two models. The call for heavy duty vehicles is declared to be limited at this time.

Oldsmobile Producing New 2-Passenger Car

LANSING, MICH., Dec. 27—A new two passenger closed car is being fitted to the four cylinder Oldsmobile chassis and will sell for \$1,195. It will be shown at the New York and Chicago shows. The finish is in blue with gold striping, the upholstery being gray spanish leather with inside top lining of taupe velour. The doors are 25 in. wide, seat 43 in. wide and cab height 46 in.

Plate glass is used throughout and there is a roll curtain for the rear window. The standard equipment will include gearset lock, cowl ventilator, windshield wiper, visor, dome light, drum shaped headlamps and double windshield. The rear luggage compartment contains 12 cu. ft. and the compartment back of the seat 3 cu. ft.

Taxicab Owners to Hold Convention in Chicago

CHICAGO, Dec. 26—The semi-annual winter convention of the National Association of Taxicab Owners will be held at the Hotel Sherman, Feb. 15 to 16. Membership of the association includes more than 100 companies located throughout the United States, with members also in Canada, Mexico and Japan.

Problems of vital interest to taxicab operators will be discussed, including subjects such as insurance, municipal ordinances for the regulation of taxicabs, "jay walking," rate reduction and safety campaigns.

John J. Boobar, general manager of the Terminal Taxicab Co. of Washington, is president of the association. John G. Williams is secretary.

Want Reorganization of Syracuse Rubber

Members of Stockholders' Committee Favor It in Preference to Forced Sale

SYRACUSE, Dec. 26—Reorganization of the Syracuse Rubber Co., now in the hands of William F. Rafferty, as receiver, is proposed by a stockholders' committee. The definite plan has not been worked out but one will be presented before time comes to take action on the proposed sale of the plant.

The committee in urging reorganization instead of a forced sale of the plant points out that a sale of the plant and assets would not provide sufficient funds to meet the claims of all bondholders and cover current liabilities, to say nothing of paying dividends to the 5300 stockholders.

The company is capitalized for \$6,000,000, of which \$1,447,310 is in outstanding preferred stock and \$1,263,930 in outstanding common stock. The appraised value of the plant is \$455,530 against which is an issue of 20-year 7 per cent first mortgage bonds amounting to \$134,000 and \$53,500 pledged as collateral.

The committee figures that \$250,000 working capital and \$220,000 to cover current liabilities is necessary, making \$470,000 required for refinancing, less \$125,000 the net cash value of current assets. Orders on hand approximate \$200,000, while the proposed reorganization plan, it is said, would mean a production of 350 tires a day with a profit of \$28,000 a month.

Stromberg Will Decide on Increased Capital

CHICAGO, Dec. 26—Stockholders of the Stromberg Carburetor Co. of America, Inc., have been called together for a special meeting on Jan. 10 to vote upon a proposal of the directors to increase the capital stock from 75,000 to 150,000 shares. The new stock would have no nominal or par value. In the letter notifying the stockholders of the meeting, President C. W. Stiger says:

"The proposed increase of the capital stock of this corporation is needed for the purpose of enlarging our business by adding to our present facilities and by acquiring additional properties."

It was definitely stated that the proposed stock increase would not be used for the purpose of a stock dividend distribution at the present time.

G. M. APPEARS IN SUIT

WILMINGTON, DEL., Dec. 26—In the Deppe-General Motors patent suit, John P. Laffey, counsel for General Motors Corp., entered a formal appearance in the United States District Court here today.

December Exceeding Best Mark in Texas

Surpassing Previous Christmas
Periods—Likely to Be Record
Month of Year

DALLAS, Dec. 27—Despite the present winter weather and the fact that there was a tendency toward "tightening up" in all lines, the actual retail sales of automobiles in Texas during December probably set a record for the year, and certainly will surpass any previous December in the history of the business in this State, according to reports from various sections.

Dallas dealers report retail sales are showing a 20 per cent gain over those of last December. In Houston sales are running 25 per cent better than a year ago, and San Antonio retailers say the increase in that territory will be 30 per cent. A 15 per cent increase is indicated in Fort Worth and Wichita Falls. Galveston, Beaumont, Waco, Abilene, Orange, El Paso, Amarillo, Denison, Sherman, Tyler, Greenville, Palestine, Port Arthur, Corpus Christi and Texarkana report a probable gain of from 10 to 15 per cent when compared with December of 1921.

No record is available as to the actual number of cars sold at Christmas, but a solid trainload of Buicks was distributed at San Antonio, another trainload at Houston, a trainload of Dodge Brothers cars at Dallas and a trainload of one or two other makes at Dallas and Houston. A trainload of Hudsons and a trainload of Studebakers were scattered out in north and south Texas, while several trainloads of Fords went to east and southeast Texas. This is the first time automobiles have been moving to all sections of Texas in trainloads for any one season of the year. Each trainload consisted of from 25 to 30 freight cars with from four to six automobiles to the car.

New York Prepares for National Show

(Continued from page 1300)

never were shown before. The Gray is a year old and during the last show made its debut at the Commodore. The American is somewhat of a veteran, which is staging a comeback this time under the direction of Carl Page. Among those shown last year and out this time for various reasons are the Holmes, Jackson, Stevens-Duryea, Goodspeed, du Pont, Kelsey, Dixie Flyer, Kline, Saxon, Standard, Templar, Fergus, Hanson, Itala, and Vauxhall.

Preparations for the Palace show are nearly completed. The plan of decoration is to be accomplished by boxing in each of the square columns with velvet of American Beauty rose shade in gold frames. The columns in turn are to be joined, each to the one adjoining, by

valances of velvet edged with gold braid. All the windows on the main floor are to be similarly treated, with the addition of French curtains. Each valance is to be surmounted by a specially designed ornament.

Mirror chandeliers, glittering with hundreds of electric lights, are to be suspended in the center court and the idea of palatial grandeur is to be carried out at the inner main entrance by a great French window backed by mirrors. The great urns that surmount the corners of the balconies around the court are to be treated with floral decorations to give added richness to the whole. The names of the exhibitors are to be in raised white letters on a red panel with gold borders.

Blue, set off by foliage and flowers, is the color scheme decided on for the second and fourth floors and green is to be utilized for the third floor.

Patton-Pitcairn Plans Largest Plant of Kind

MILWAUKEE, Dec. 26 — What is planned to be the largest single plant in the United States devoted to paint and varnish manufacture is under construction at Milwaukee by the Patton-Pitcairn division of the Pittsburgh Plate Glass Co. The division is a consolidation of the Patton Paint Co. and Pitcairn Varnish Co., old-established Milwaukee industries long affiliated with the plate glass concern before an actual merger of interests was effected some time ago.

The new building, costing \$400,000, will be ready early in January. It is the first unit of the proposed construction to replace the present Patton and Pitcairn plants in Milwaukee. It is being equipped mainly as a research laboratory, in which all the scattered laboratories of the Pittsburgh company will be consolidated.

The intention is to apply to the paint and varnish industry the research methods successfully used in developing the plate glass industry.

New Plate Glass Factory

PITTSBURGH, Dec. 26—The Pittsburgh Plate Glass Co. is planning to erect a new plate glass factory at Creighton, Pa., which will have a capacity of from 15,000,000 to 20,000,000 feet annual production. It will be built in sections for the purpose of getting increased production at the earliest possible moment. When completed the plant will have a capacity equal to a third of the present production of the company.

BUICK NOT TO CLOSE

FLINT, MICH., Dec. 27—For the first time the Buick Motor Co. will not close its plant for the annual December inventory. President Bassett declares that there is no let-up in the volume of orders for immediate delivery, and because of this it is impossible to close the works for inventory. December, he says, will be another record month.

Peerless Arranges for Collins Notes

Will Pay Them Far in Advance—
Factories in Cleveland at
Work on Closed Cars

CLEVELAND, Dec. 27—Automobile factories in this city are operating on schedules arranged to meet an anticipated big demand for closed cars in 1923. Never before at this time of year have plant facilities been given over in so large a measure to the production of closed models. The seasonal demand is largely responsible, but an unusually large number of this type of car will be turned out for delivery in the spring.

Peerless Motor Car Co. is devoting considerably more than half of its production to closed cars. Chandler, Cleveland, Jordan and Stearns also are expanding their output along the same line.

Richard H. Collins, president of Peerless, states that the company will anticipate by a year and a half final payment on the Peerless-Collins notes, which were issued at the time he purchased control of the company. Funds have been deposited with a local bank for payment on April 1, 1923, of notes due October, 1924.

Year's End Brightened in Section of Indiana

(Continued from page 1300)

dition, the effect that the strike had on the buying morale of people not directly concerned was a handicap to all sales.

Then came the rail strike, the almost complete cessation of freight traffic in the mine country and toward the end of the summer there were many blue weeks, as well as blue Mondays. Thousands of cars were kept in garages and woodsheds because the owners did not want to spend money for gasoline. Work almost stopped in maintenance departments.

With the coming of the labor peace buyers showed a tendency to return, but there were debts to pay. Christmas shopping here was good on small and lower priced articles.

Hayes Likely to Acquire Imperial Wheel of Flint

DETROIT, Dec. 27—Stockholders are asked to ratify a deal which means the absorption of the Imperial Wheel Co. of Flint by the Hayes Wheel Co. of Jackson. This meeting is set for Jan. 3, and inasmuch as more than 75 per cent of the Imperial stockholders already have agreed to the plan, it is expected the deal will go through.

President Hayes desires the Imperial plant because of its location equidistant from the Buick, Chevrolet and the new Durant plants in Flint, all of which are using Hayes wheels.

Durant's Flint Car Has First Showing

Chassis of New 6-Cylinder Addition Has Engine with 7-Bearing Crankshaft

(Continued from page 1298)

frame in line and prevents undue stresses on the members supported by it, and on the body, thus obviating body squeaks. Special washers fitting the circumference of the tubes are placed where the engine supporting arms rest on the tubes. The engine is held down by "through" bolts.

As in other models of Durant Motors the engine and gearset are separate units, the connection between them comprising two Spicer universal joints. The clutch is of the single plate, multiplying lever type and is completely inclosed in the flywheel. The gearset, which gives three forward speeds and one reverse, is a very compact unit and is bolted to the rear face of the rather deep central cross member of the frame.

Arrangement for Drive

The final drive is by an open propeller shaft with two Spicer joints, the drive being a Hotchkiss type. The rear axle drive is by spiral bevel gears and it is intended to offer a choice of several gear ratios. One of the driving gear sets has 9 teeth in the pinion and 43 in the ring gear. The gears are of 4.65 pitch and have a face width of 1½ in. All bearings at the center of the axle are of the ball type, while those at the wheels are conical roller bearings.

The axle is a built up, semi-floating type and is made by the Adams Axle Co. Both brakes are carried on the rear wheels and act on the same 14-in. drums. The band brakes are the service brake and are 2 in. wide, while the hand-operated internal brakes are only 1¾ in. wide. Provisions for brake adjustment are made both directly at the brakes and in the brake linkage, the latter being of the form of coupling which can be taken up without first taking it apart.

Construction of Frame

The frame is built up of side members with a section of 5½ by 1¾ by ¾ in. at the middle. These side members are straight from end to end in the vertical plane but the width of the frame tapers off from rear to front, as is shown by the fact that the front spring center distance is 26½ in. and the rear 37½ in. The frame has three pressed steel cross members, and in addition a tubular cross member at the extreme rear. Its stiffness is added to by the tubular muffler which is flange-bolted to the center and rear cross members. This muffler, together with the tubular sub-frame, is claimed to give such rigidity to the frame that it is possible to drive the car over the floor with only three wheels in place.

The steering gear is a Warner worm and gear type and has an 18 in. hand

wheel with wood spokes extending all the way in to the aluminum hub to which they are bolted. The arrangement of the control members in the front compartment is somewhat out of the ordinary.

The steering post is in the usual position at the left, and the gear shifting lever in the center, but the latter is so short that its top comes flush with the top of the front seat, and as it stands close up to the seat when in the rear-most position it does not interfere with entrance to and exit from the driver's seat. The brake lever is placed alongside the front door, rather far forward, so as not to interfere with the use of this door, and is operated by the left hand.

The car has a wheelbase of 120 in. and is equipped with 32 by 4½-in. Fisk cord tires.

Body and Accessory Features

The open body is of the wood frame, sheet metal panel type and is of attractive appearance. It has a permanent top with the rear section completely metalled. There is a large bevel edged glass in this rear section. The cowl is provided with a ventilator which is operated by a lever underneath.

The so-called instrument board light is concealed in the cowl and gives unusually good illumination of the whole board. Among the equipment may be mentioned the Stewart speedometer, motor horn, complete set of electric lamps (including large size headlamps of barrel type and separate side lamps), a tool kit, pump and jack. There are die cast, enameled caps on the doors and door posts are provided for the side curtains. The chassis is fitted for Alemite lubrication.

Iowa Reports Used Car Values at Lowest Mark

DES MOINES, Dec. 26—According to a study just completed by S. P. Whiting, secretary of the Motor Trades Bureau of the Des Moines Chamber of Commerce, prices of used cars in November reached the lowest mark in the history of Iowa motor markets.

Whiting bases his conclusion on a survey of the weekly sheets covering used car transactions of the Des Moines automobile dealers supplemented by special reports from the leading dealers of central Iowa.

The survey reveals that lower prices of new cars through lower cost of material and keener competition is one of the chief reasons for the drop in used car values. It also shows that every decline in new car prices has been accompanied by an even sharper cut in used cars.

Another reason given by Whiting for the new low mark is that the present methods of financing the purchase of new cars by manufacturers and motor financing companies have worked to a decided advantage of the new cars, as it gives the purchaser a plan for buying a car with a down payment no larger than the price of a used car.

N.A.D.A. Will Hear Talk on Sales Cost

Richard Lennihan of Harvard Bureau to Address Dealers at Convention

ST. LOUIS, Dec. 27—Because of the interest of dealers generally in cost accounting and in developing a more thorough understanding of the relation between operating costs and total sales revenue, the 1923 convention of the National Automobile Dealers Association in Chicago, Jan. 27-30, will give a prominent place in its program to Richard Lennihan, assistant director of the Harvard Bureau of Business Administration.

Recent investigations of the association into the costs of doing business in the retailing of automobiles disclosed a widespread difference in the percentage of the "overhead" as compared to the total sales. These automobile business costs when compared to the costs of doing business in other merchandising lines expose a variance which the association executives believe is due to variance in the methods of accounting.

Lennihan's subject will be "Cost of Doing Business in Relation to Sales." His address will be given the afternoon of Monday, Jan. 29, and will cover comparison of costs in a number of merchandising lines together with some phases of the automobile business.

Bureau May Survey Conditions

The Harvard business administration bureau made exhaustive studies of the cost of doing business in the wholesale grocery field and in the retail shoe business for 1921. These studies disclosed the trend of increased costs as affected by the downward trend of prices.

Similar studies applied by the N. A. D. A. to the automobile business for 1921 have not been completely compiled but may be available for announcement by Lennihan as a part of his address. Because of the lack of general harmony in the methods of cost computing in the automobile business, it may develop that a thorough research on this subject will be undertaken for the association by the Harvard bureau.

As a corollary to Lennihan's address there will follow him on the program, a lecture on "Modern Methods of Salesmanship."

NEW YORK WANTS FEES CUT

BUFFALO, Dec. 26—A resolution was adopted by representatives from all the automobile federations of New York State at a convention here, asking the State legislators to introduce a bill amending the present law which calls for the payment of 75 cents per 100 pounds on all cars weighing over 3500 pounds. The federation representatives are in favor of fixing this rate at 50 cents per 100 pounds and a flat rate of \$10 for electric vehicles.

FINANCIAL NOTES

Johns-Manville, Inc., stockholders have approved an increase in capitalization to 250,000 shares, of no par value, from 25,000. New stock is to be distributed in the proportion of eight new for one old, and the balance of 50,000 shares is to be sold to employees at \$50 a share. The amount allotted to stockholders has already been over-subscribed, more than 1000 employees applying for a total of more than 67,000 shares. Directors recently declared a cash dividend of \$40 a share and voted to retire the preferred stock at \$120 a share.

Packard Motor Car Co. for November will show net earnings for the quarter ending Nov. 30, after taxes, interest and all charges, of slightly more than \$2,500,000 available for dividends. After allowing for preferred dividends this is equivalent to 98 cents a share on the 2,377,000 shares of \$10 par common stock which would be outstanding following the recent 100 per cent common stock dividend, or at the annual rate of nearly \$4 a share.

Wayne Tank & Pump Co. preferred stock to the amount of \$500,000 will be retired Jan. 1, this decision being reached following a special meeting of the stockholders. At the meeting authority was granted to increase the common stock of the company from \$700,000 to \$1,000,000. The action on the part of the company does not contemplate any changes in business policy or extensions of the plant, it is said.

Moon Motor Car Co. has declared a quarterly dividend of 37½ cents on common stock, thereby increasing the annual rate from \$1 to \$1.50, and an extra dividend of 12½ cents. The regular quarterly dividend of \$1.75 on preferred stock also has been declared. The directors have voted to retire the outstanding preferred stock, which amounts to \$314,000. All dividends are payable Feb. 1 to stock of record Jan. 15.

U. S. Light & Heat Corp. of Niagara Falls states that the year now closing has been one of the most satisfactory in its history, with earnings of well over \$300,000. The number of storage batteries sold is reported to have been over 70 per cent in excess of the best previous year.

Auburn Automobile Co. has declared the regular quarterly dividends of 1¼ per cent on preferred and \$1 a share on common stock, both payable Jan. 1 to stock of record Dec. 22.

Crane-Simplex Co., Inc., has declared an initial quarterly dividend of 1¼ per cent on preferred stock, payable Jan. 3 to stock of record Dec. 21.

DEVELOPS RINGLESS PISTON

NEW YORK, Dec. 27—The Franchi Ringless Piston Corp. of this city has developed an automobile engine piston which is intended to be used without flexible rings. I. D. Gutenstein and Aldo Franchi of the concern will demonstrate a Studebaker car fitted with these rings in Detroit during the latter part of January.

BUILDS NEW BATTERY BOX

STANLEY, WIS., Dec. 26—The Stanley Toy Works have placed into quantity production, following the relief of facilities from holiday merchandise require-

ments, a standardized battery box which they have been manufacturing for several months. A single order for 18 carloads was booked during the past week for delivery from Jan. 1 to May 1. The box is made from No. 2 maple, a large supply of which abounds in the vicinity of Stanley. The concern maintains their own dry kiln plant, which has a capacity of 40,000 ft. The daily consumption of the factory runs about 5000 ft., which will be doubled shortly on the battery box run.

Canada Spent \$1,115,918 for Parts in November

OTTAWA, ONT., Dec. 26—Canada spent \$1,105,410 in the United States for automobile parts during November, 1922, according to a report of the external trade branch of the Dominion Bureau of Statistics.

During the same month the Dominion spent \$7,901 for parts in Great Britain, \$2,330 in Italy and \$277 in Switzerland.

The total expenditure shows a remarkable increase over November, 1921, when importations amounted to only \$415,882.

During November, 1922, Canada imported but three passenger automobiles from the United Kingdom, as compared with 459 from the United States. The value of the importations from Britain was \$11,054, as compared with \$521,929 for those from the United States. Canadians bought two Italian cars during the month, at a value of \$2,732. The total value of automobile importations during November, 1922, was \$535,715, as against \$452,396 in November, 1921, and \$783,543 in October, 1922.

Venezuela Plans Show at Caracas in January

CARACAS, VENEZUELA, Nov. 14 (by mail)—An automobile exposition is being planned for this city next January, with the representatives of all or practically all automobile lines sold here co-operating in what will be the first attempt to hold such a show in the northern section of South America.

Conditions affecting the automotive trade here are showing satisfactory improvement, and a greater degree of enthusiasm is being displayed by the representatives of all the more popular lines. Service, however, is still a problem, and it is hoped that every effort will be made by manufacturers to force the installation of better facilities.

WILLS JOHNSON DEAD

NEW YORK, Dec. 27—Wills Johnson, chairman of the appropriations committee of the General Motors Corp., died suddenly Christmas Day at his home near Greenwood, Va. He also held the position of an assistant to Alfred P. Sloan, Jr., vice-president in charge of operations of General Motors. Johnson was connected previously with the duPont company in the engineering department.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Last week the rate for call loans ranged between 4 per cent and 5 per cent, as compared with 3¼ per cent to 5 per cent in the preceding week. For fixed date maturities the market was quiet and was characterized by no special transactions. The quotations continued at 4¼ per cent to 5 per cent for all periods from sixty days to six months, the same as in the preceding week. The prime commercial rate remained unchanged at 4¼ per cent to 4½ per cent.

Revenue freight loadings for the week ended Dec. 9 totaled 919,823 cars, an increase of 74,609 cars over the loadings for the preceding week and 178,587 cars more than in the week ended Dec. 9, 1921. The demand for freight cars in excess of the available supply on Dec. 8 showed a decrease of about 16 per cent from the shortage of Dec. 1.

Bank clearings at the leading cities of the United States totaled \$7,831,613,000 for the week ended Dec. 21, which was a gain of 17.5 per cent over the preceding week and 8.6 per cent over the corresponding week last year. The turnover of business, as marked by bank clearings for New York City for the week ended Dec. 21, showing a gain of 4.6 per cent over the corresponding week last year.

According to the complete returns filed with the Interstate Commerce Commission, total gross earnings of 193 Class 1 railroads were larger for the month of October than for any preceding month since December, 1920. Net operating income totaled \$85,254,996, marking a new high record for this year and the largest monthly total since October last year. This is equivalent to a return of about 4 per cent on the tentative property valuation as fixed by the Interstate Commerce Commission, and compares with 2.88 per cent for September and 5.01 per cent for October of last year. For the ten months ended with October, net operating income of Class I railroads amounted to \$614,317,269, equivalent to an annual return of 3.97 per cent, as compared with an annual return of 3.23 per cent for the first 10 months of 1921.

The Federal Reserve statement as of Dec. 20 showed a decrease of \$15,313,000 in gold reserves and \$28,179,000 in total reserves. Bills on hand decreased \$55,044,000, while total earning assets showed an increase of \$68,950,000. Deposits increased \$20,849,000, and Federal Reserve notes in circulation increased \$77,526,000.

"POWER FARMING DAY"

CHICAGO, Dec. 26—A resolution favoring the designation of one day at State fairs next year as "Power Farming Day," was adopted by the International Association of Fairs and Expositions at its thirty-second annual meeting recently at Toronto.

Profit Is Reported by British Dunlop

Sir Eric Geddes May Be Chairman
of Board, Succeeding F. A.
Szarvasy

LONDON, Dec. 9 (by mail)—A net profit of £588,267 is reported by the British Dunlop Rubber Co. for the ten months ended June 30 against a loss of £8,320,006 for the preceding twelve months.

It is stated that the profits from all sources, less depreciation and "after charging to the reserve account losses of forward contracts over market prices arising during the period," amount to £1,054,683, but from this there have to be deducted £44,108 net trading loss of Dunlop Plantations, £115,310 net trading loss of the Improved Steel Co. and £306,996 interest.

The reserve fund now stands at £907,520, which is £1,860,124 lower than in the last balance-sheet. Loans from the bank have increased by £652,312 to £2,019,977. After deducting the profit now reported, there is still a debit balance of £7,731,739 on profit and loss account.

The necessary capital for the American subsidiary company has now been found, and the financing will take the form of a joint issue of capital in the United States and England.

A statement issued by the directors mentions the appointment of Sir Eric Geddes as a director and foreshadows his election as chairman of directors in place of F. A. Szarvasy, who undertook the reorganization of the management and finances two years ago and has temporarily held the office of chairman since then.

Timken Service Company Will Function January 1

CANTON, OHIO, Dec. 28—The Timken Roller Bearing Sales & Service Co., which brings the servicing of Timken bearings directly under the supervision of the Timken Roller Bearing Co., will start to function on Jan. 1. The new company adds the final link to the chain of complete control which the Timken Roller Bearing Co. exercises over its product from the raw material to the sale and maintenance of the finished bearing.

The parent company has complete factories located at Columbus, Ohio; Birmingham, England; Paris, France; Walkerville, Ontario, and in this city, and maintains 32 direct factory branches throughout the United States and Canada. In addition there is a country-wide organization of registered authorized distributors in the smaller cities.

GOVERNMENT WANTS TRACTORS

WASHINGTON, Dec. 27—While no appropriation was made in the 1924 budget submitted to Congress by the

President for new automobiles and automotive equipment, such as trucks and motorcycles, an item of \$1,700,000 is provided for the purchase of tractors. General Pershing and his staff have inspected a great many designs submitted.

INDUSTRIAL NOTES

Northlite Manufacturing Co., Chippewa Falls, Wis., has disposed of its gray iron foundry to A. M. Mattson and A. J. Torgerson of Eau Claire, Wis., who will continue its operation as the Mattson Foundry Co. The machine shop also has been placed on the market. The Mattson company will install additional facilities for brass and aluminum casting.

Van Norman Machine Tool Co.'s Detroit sales office will be managed after Jan. 1 by R. A. Griswold. Griswold previously represented the Rivet Lathe & Grinder Co. in Detroit and other sections of the country, and later served with B. C. Ames as field representative.

Globe Malleable Iron & Steel Co., Syracuse, has received an order for 150,000 sets of forgings from the Durant Motors, Inc. The contract calls for the completion of 125,000 sets before Feb. 15. The plant is being operated day and night to handle the order.

Theodore L. Dodd & Co., 80 East Jackson Boulevard, Chicago, with a branch office in the General Motors Building, Detroit, has been appointed western sales representative of the Cleveland Wrought Products Co. of Cleveland, Ohio.

Universal Shock Eliminator Co., Inc., of 7 West 61st Street, New York, has taken the Eastern distribution for the Lockhead four-wheel brake system, made by the Four Wheel Hydraulic Brake Co. of Detroit.

Stock Dividend Doubles Capitalization of Cole

INDIANAPOLIS, Dec. 27—Cole Motor Car Co. has declared a 100 per cent stock dividend on the 10,000 shares of capital stock of \$100 par, thereby increasing the company's capitalization to 20,000 shares. The dividend is payable to stock of record of Dec. 15.

This is the third stock dividend which the company has declared, it having paid one of 65 per cent in July, 1912, and one of 20 per cent in July, 1914. In 1921 the company paid cash dividends of 20 per cent quarterly.

Gasoline Consumption Declined in October

WASHINGTON, Dec. 27—The monthly report of the Bureau of Mines shows that the domestic consumption of gasoline decreased by 18,000,000 gallons or 3.6 per cent during October as compared with previous month. It was, however, about 7.5 per cent above the figure for October last year.

October production of gasoline amounted to 566,278,689 gallons, the highest recorded except for last July when this figure was exceeded by only 3,400,000 gallons.

METAL MARKETS

Seldom has the steel market presented so serene an aspect in the last week of the year as is the case in 1922's few remaining days. Fewer mills than usual have shut down for repairs. Sales managers report a very gratifying amount of first quarter 1923 business in process of negotiation. The automotive industries are responsible for the greatest part of these inquiries which, according to one report, embrace one individual automotive inquiry involving 200,000 tons of bars and other rolled material. Demand for full-finished body sheets continues fair, but most of the orders actually booked within the last few days appear to have carried a compromise price between the 5 cents base nominally quoted by independent rollers and the 4.70 cents base price of the chief interest.

Demand for specialties, such as hot- and cold-rolled strip steel, has surpassed the expectations of producers. In fact, while ultraconservative steel men refuse to commit themselves regarding the outlook over the entire year 1923, they are ready to concede that the industry will be normally active during the first quarter of the year, this statement involving no risk because the business already booked for the first quarter of 1923 is sufficient to make a rate of operations a positive certainty.

A year ago the general run of prophecies was bleak, and developments, especially those of the second half of the year now drawing to a close, proved that the demand for steel had been much under estimated. Today there is in evidence general confidence in a continuance of the present rate of demand during the winter and spring of 1923, and as for the summer and fall of the coming year there is a disposition to withhold judgment. Certain it is that the steel industry enters upon the new year with a more satisfactory backlog of orders and amid more orderly market conditions than had been generally expected a few months ago.

Pig Iron.—In most of the pig iron centers the market has quieted down. Some automotive foundries have covered their requirements for the coming quarter, while others have deemed it wise to postpone contracts for deliveries beyond January until after New Year. The Detroit base price is \$27, with some interests quoting up to \$28. The Valley base is \$26 and in Cleveland prevails about the same quotation, furnace for delivery in Cleveland. The Chicago market is steady at \$28, furnace. Pig iron sellers predict another buying spurt in January.

Aluminum.—The usual holiday lull is in evidence in the aluminum market. Quotations are unchanged. The latest London quotation received here is £92 10s. per gross ton, the equivalent of about 19½ cents on the basis of prevailing rate of exchange.

Copper.—Following the greatest activity which the copper market has enjoyed this year, demand has eased off slightly. While the buying movement was at its height, producers were able to advance prices by ¼ @ ¾ cents, the first time in more than two years that such a move was successful. As a result of the upward movement in the copper market, the chief brass interest advanced prices for rolled copper and brass products to the extent of ½ cent per pound in one week. Large orders were placed between the first advance of ¼ cent and the second one of the same extent, a large share of the business emanating from the automotive industries.

Calendar

SHOWS

- Jan. 6-13—New York, National Automobile Show, Grand Central Palace, under auspices of National Automobile Chamber of Commerce.
- Jan. 8-13—New York, Second National Automobile Body Builders Show, Twelfth Regiment Armory, under the auspices of the Automobile Body Builders Association.
- Jan. 27-Feb. 3—Chicago, Annual Automobile Salon.
- Jan. 27-Feb. 3—Chicago, National Automobile Show, under auspices of National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.

FOREIGN SHOWS

- Dec. 15-Jan. 2—Paris, Aeronautical Salon, Grand Palace. Chambre Syndicale des Industries Aeronautiques, 9 Rue Anatole de la Forge.
- Jan. 13-24—Brussels, Sixteenth International Automobile and Cycle Exposition, Palais du Conquanteinaire.
- April - July, 1923—Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.
- May 10—Berlin - Grunewald, German Grand Prix.
- Jan. 15-19—Chicago, Thirteenth

RACES

- May 10—Berlin - Grunewald, German Grand Prix.

CONVENTIONS

- Jan. 15-19—Chicago, Thirteenth

American Good Roads Congress and Fourteenth National Good Roads Show.

- Jan. 29-31—Chicago, Annual Meeting, Automobile Electric Service Association, Congress Hotel.
- Feb. 15-16—Chicago, City Club, Winter Sectional Meeting of the American Society for Steel Treating; W. H. Elsenman, 4600 Prospect Avenue, Cleveland, national secretary.
- April 25, 26 and 27—New Orleans, Annual Convention of the National Foreign Trade Council.

S. A. E. MEETINGS

- Metropolitan Section
March 15—Speaker, William P. Kennedy, President, Ken-

nedy Engineering Corp.; Subject, Trolley Buses and Flexible Vehicles for Street Railway Service.

- April 19—Speaker, Edw. E. La Schum, General Superintendent, Motor Vehicle Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.
- May 17—Speaker, F. P. Gilligan, Secretary, Henry Southern Engineering Co.; Subject, Metallic Materials for Automotive Work.

Other Meetings

- Jan. 9-12—New York, Annual Meeting.
- Jan. 31—Chicago Meeting and Dinner of the Society at the Congress Hotel.

Suggests Boulevard for New York Relief

NEW YORK, Dec. 23—Most sensational of all ideas advanced by city officials as solutions of the traffic problem in New York is that of Dr. John A. Harriss, Deputy Police Commissioner in Charge of Traffic, who advocates a 360-foot crosstown boulevard, divided into spaces for slow-moving vehicles and for traffic moving at the rate of 35 m.p.h. It would be built from river to river somewhere between 42d and 59th Streets at a cost of \$70,000,000.

The plan was outlined following the radical suggestion of Judge House of the Traffic Court that passenger cars and taxicabs be limited in number by law and that it might be for the best interests of the city to bar them from streets south of 59th Street. Dr. Harriss opposes Judge House in this, declaring that "you might as well stop the manufacture of automobiles as limit the use of passenger cars on New York City streets by legislative act. While motor cars are used for transportation, space will have to be provided for them."

Portrays City of Future

Dr. Harriss believes that New York City 100 years from now will have a population of 25,000,000; that the section from the Battery to 14th Street will be given over to storage and provision warehouses; the manufacturing and wholesale district will be from 14th to 42nd Street; the financial district will be from 42nd to 59th, with all north and south avenues and streets commercial and office buildings; the de luxe shopping district will be from 59th to 110th Streets, with an additional shopping section between 110th and 125th, while the residential section will be north of 125th to the Connecticut State line.

Visualizing the city in the future in this manner, Dr. Harriss outlined his boulevard plan as follows, suggesting that the immediate need is for the first of four cross-river boulevards:

A boulevard 360 feet wide from the Hudson River to the East River would be arranged as follows:

	Feet
Sidewalks, 30 feet wide.....	60
West bound traffic, next to curb.....	100
East bound traffic, next to curb.....	100
Center of Boulevard made up as follows:	
West bound express traffic.....	50
East bound express traffic.....	50
	360

The express traffic would pass under all of the north and south bound streets, with ramps to Sixth Avenue express highway and an artistic Park Avenue viaduct.

The turning of vehicular traffic or crossing of pedestrians permitted at street intersections only. Theater zones would be at the east and west end of the boulevard with automobile terminals and parking hotels.

Beneath the boulevard provision would be made for the parking of cars.

This express highway to connect with the elevated express highway on either side of the present Sixth Avenue elevated road, each 40 feet wide.

The express highways would connect with the marginal way express highways or express streets on the extreme west side and east side of Manhattan Island.

As the center of serious increasing congestion lies in the zone between Forty-second Street and Fifty-ninth Street, and as this condition has become acute and requires immediate relief, it is suggested that the other cross boulevards be not considered at this time.

S. C. Johnson to Build Factory in Australia

RACINE, WIS., Dec. 26—A complete manufacturing plant costing about \$200,000 when finished will be erected at Sydney, Australia, by the S. C. Johnson & Son Co., manufacturer of waxes, polishes, etc., according to announcement made at the annual sales conference here. The company has maintained a branch office and distributing warehouse at Sydney for ten years, but Australasian business has increased so rapidly that the long time needed to get merchandise from Racine to Sydney must be overcome.

Southern Optimism Confirmed by Bank

ATLANTA, Dec. 26—Commercially, industrially and financially the Southeast is in a better shape at this time than it has been in many years, according to the monthly review of the Federal Reserve Bank of Atlanta.

Of the important lines of wholesale and retail trade reporting every one showed an increase the past two months as compared with two preceding months, and a substantial increase as compared with the same period in 1921, including automotive and accessory dealers, farm implements and tractors.

Virtually all manufacturing industries reported the same, and a shortage of labor for the first time in years. Financially the district has plenty of money due to the excellent crop prices this season, and bank clearings in all important southeastern cities are considerably larger than at this time a year ago.

Automotive sales all along the line—that is, higher priced as well as medium and lower priced cars—are in larger sales volume than for months with the 1923 outlook, so distributors advise the bank, portending another inflation period. They believe, however, that this inflation period will be on a more stable basis than that of 1919, and not followed by the long months of deflation.

Tractor, implement and truck sales were considerably better in October and November this year than in 1921, though the usual seasonable decline in tractor and implement sales is, of course, being noted. The 1923 spring outlook for tractors and implements for the entire South is the best it has been since the latter part of 1919 distributors here advise.

WINTON DROPS BRANCH

TOLEDO, Dec. 28—The Winton Co., following a policy established early in the year, has disposed of its Chicago factory branch and has appointed the Allison-Rood Co., former Lincoln distributor, as its Chicago sales agency.



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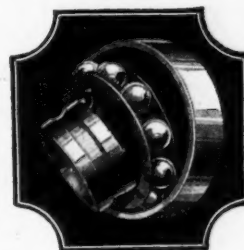
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"NORMA" PRECISION BALL BEARINGS



For Lighting Generators and Ignition Apparatus

"NORMA" Precision Ball Bearings are the standards in lighting generators and ignition apparatus of the better class.

"NORMA" equipped electrical apparatus is standard on cars, trucks, tractors, power boats, airplanes and motorcycles built to a quality standard and sold on a quality basis.

Quality invariably seeks association with quality.

Service records prove that lighting generators and ignition apparatus equipped with "NORMA" Precision Ball Bearings, run more quietly, last longer.

A booklet will be sent on request. And our engineers will welcome an opportunity to work with yours.

THE NORMA COMPANY OF AMERICA

Anable Avenue
Long Island City New York
BALL, ROLLER AND THRUST BEARINGS

G&O

Radiators

Seventh Year

Diagonal Honeycomb
Square Wireless
Mercedes Honeycomb
Herringbone Diagonal
Square Fin Tubular
Multi-tubular

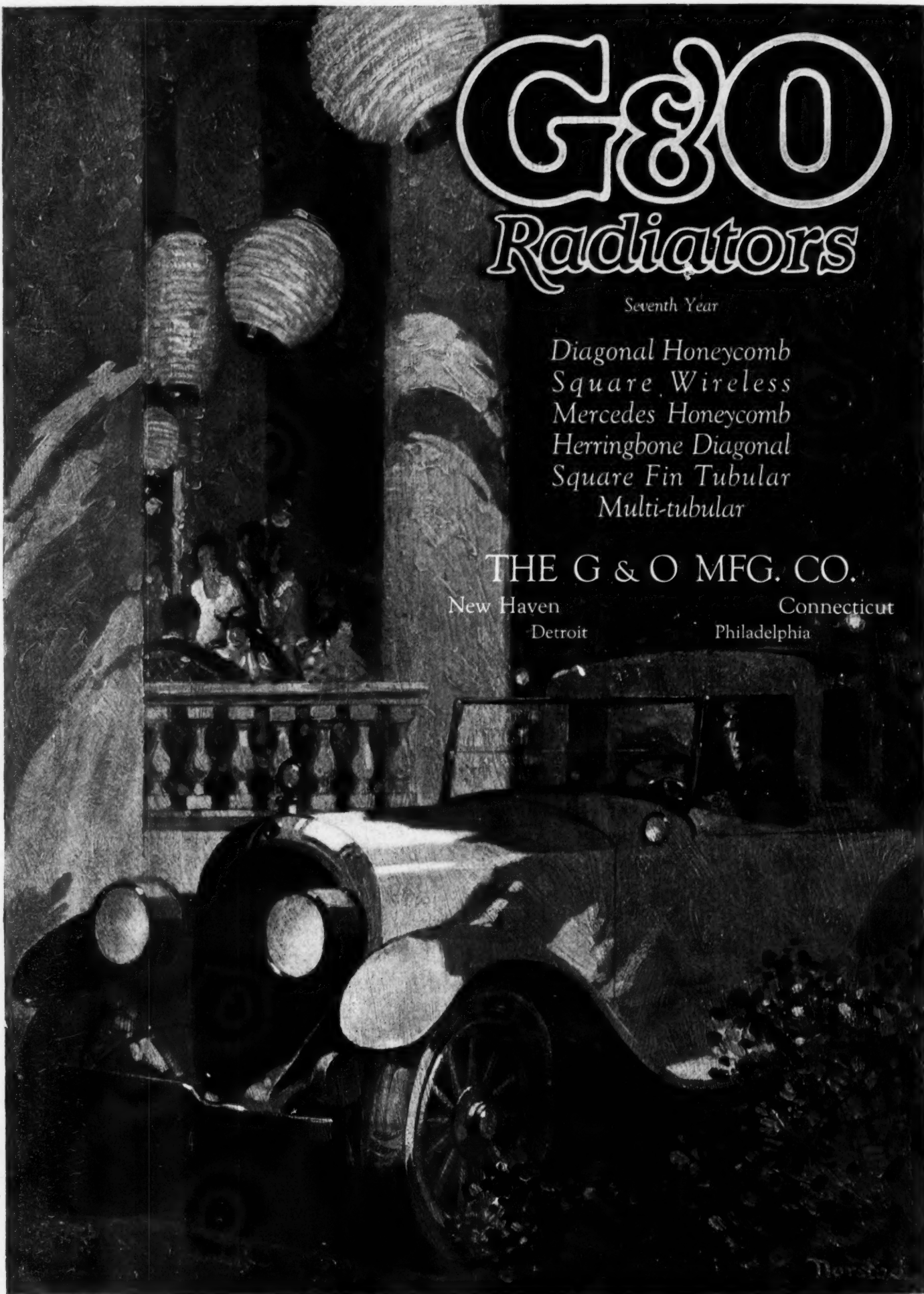
THE G & O MFG. CO.


New Haven

Detroit

Connecticut

Philadelphia



“HAT would happen if we woke up some morning and found all the advertising in the morning papers interesting?”

This question was put by Bruce Barton in a meeting some time ago. I was reminded of it when I read the article about Show advertising in last week's **AUTOMOTIVE INDUSTRIES**.

What an illuminating array of adjectives! Most of them are worn threadbare with usage, and almost useless.

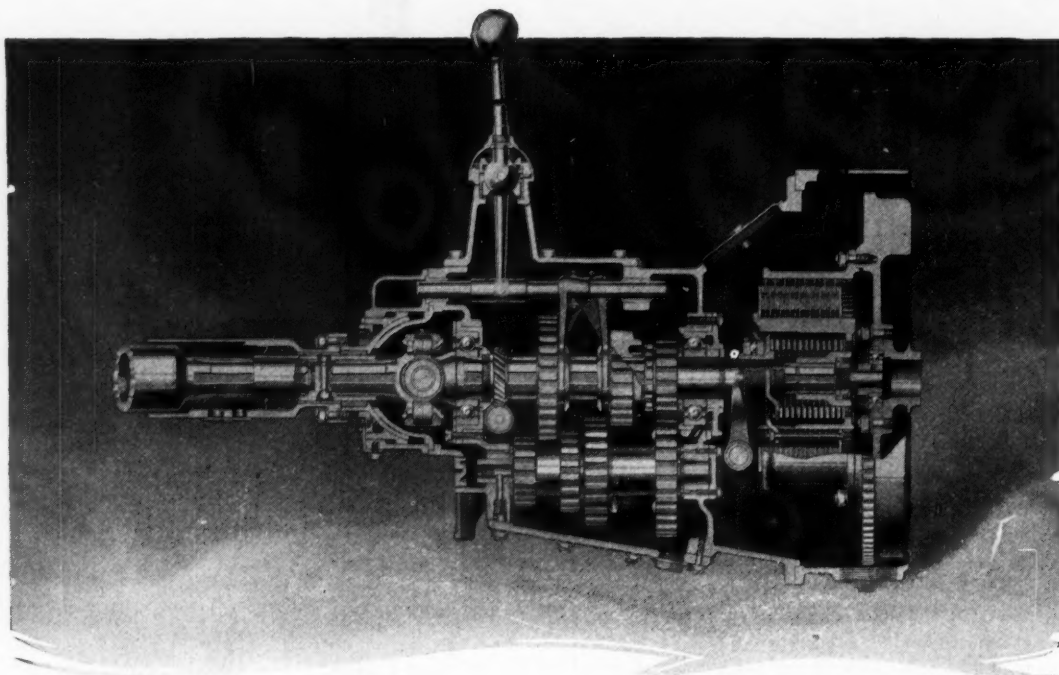
The automobile is an interesting product. People talk about it. Men discuss the matter at their clubs and women at their afternoon teas.

Hours of conversation are consumed all over this country, talking about its virtues and faults. Evidently a lot can be said. These hundreds of thousands of people would be interested if the advertising said something.

What would happen to the automobile business if the advertising of the product became really interesting to read?

It is a question worth thinking about.

HARRY TIPPER.



Where Parts Are Inaccessible Ball Bearings Give the Greatest Protection

CLUTCH-PILOT and mainshaft transmission bearings are two of the most vital shaft supports in a car, yet they are hidden away where inspection is difficult and adjustments and replacements are costly to make.

Deep-groove ball bearings made by the Hess-Bright Manufacturing Company protect these vital parts in the Lafayette car. In this type of bearing, radial and thrust loads in combination are taken by highly polished

steel balls which roll freely in deep uninterrupted grooves accurately ground in the hard steel races. So little wear occurs that even after years of service it is not measurable by ordinary means.

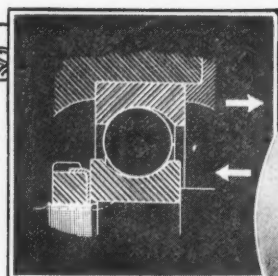
The benefit of the extensive researches conducted by our fully equipped laboratory and of our experience in applying ball bearings to automotive equipment of all kinds is at your disposal. May our service engineers co-operate in solving your bearing problems?

THE HESS-BRIGHT MANUFACTURING COMPANY

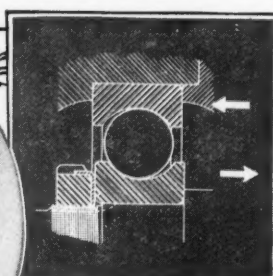
Supervised by **SKF** INDUSTRIES, INC., 165 Broadway, New York City

882

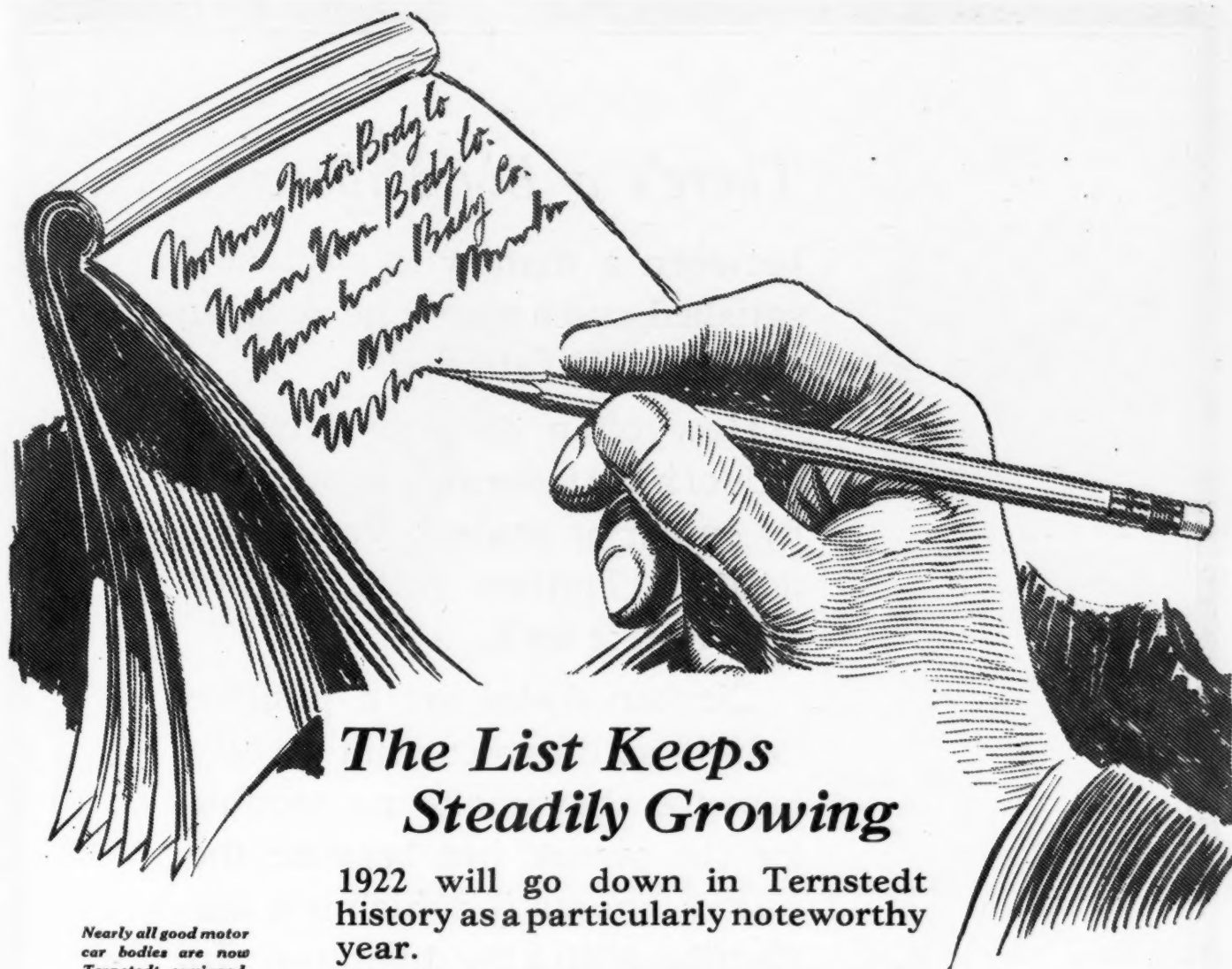
**BALL
BEARINGS**
*The Highest Expression
of the Bearing Principle*



Races displaced to show
DEEP-GROOVE bearing
carrying maximum
end thrust in a forward
direction.



Races displaced to show
THE SAME bearing
carrying maximum
thrust in reverse direction.



Nearly all good motor
car bodies are now
Ternstedt equipped.

The List Keeps Steadily Growing

1922 will go down in Ternstedt history as a particularly noteworthy year.

Not alone because of the enormously increased demand that necessitated extensive plant additions—

But, because in supplying that demand, many new and prominent names have appeared on the books of Ternstedt.

And the list keeps steadily growing.

TERNSTEDT MANUFACTURING COMPANY
6307 West Fort Street Detroit, U. S. A.
Division of Fisher Body Corporation

TERNSTEDT
*Largest Manufacturers of Automobile
Body Hardware in the World*



There's a Big Difference

between a man who says he's satisfied, and a man who *doesn't* say he is *dissatisfied*.

How often do you hear the axle of a car favorably mentioned by owner or dealer? Very often if it's a Timken Axle, mighty seldom if it isn't.

Timken Axles are a positive help in selling a car, not merely because they make no trouble for the owner, but because the *buyer knows* it, which is a distinction with a big difference. In other cases he doesn't know until he's had experience—and his first purchase is an experiment.

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT, MICH.

Sole Representatives in the British Isles:

AUTOMOTIVE PRODUCTS COMPANY, 3, Berners Street, London, W. 1.



Motor car axles should be designed not only for long life and efficient service, but with an additional margin of strength to assure human safety.



—It's the same with Screw Threads

Despite the use of a very elaborate system of master, working and inspection gages, the failure of screws continues to be one of the mechanical world's greatest problems. The trouble is—like the old boiler tender shown here—thread gages depend upon the "feel."

But a screw which touches the ring gage only at a point or two, may feel just right to the most careful inspector. "Feel" is not dependable.

On the other hand, the Hartness Comparator projects the outline of the thread against a tolerance chart 200 times enlarged.

Each tiny error of lead, eccentricity, pitch diameter, form and other controlling factors can be SEEN and corrected.

A method 10 times faster. For every screw machine department and tool room. Catalog?

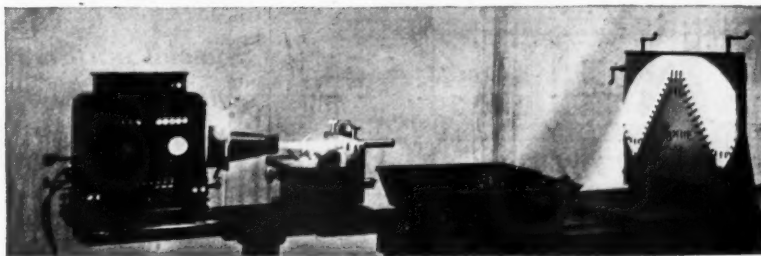
JONES & LAMSON MACHINE CO.

Makers of the Hartness Flat Turret Lathe and the Fay Automatic Lathe
Springfield Vermont, U. S. A.

Branch Office:
503 Market St.,
SAN FRANCISCO, CAL.

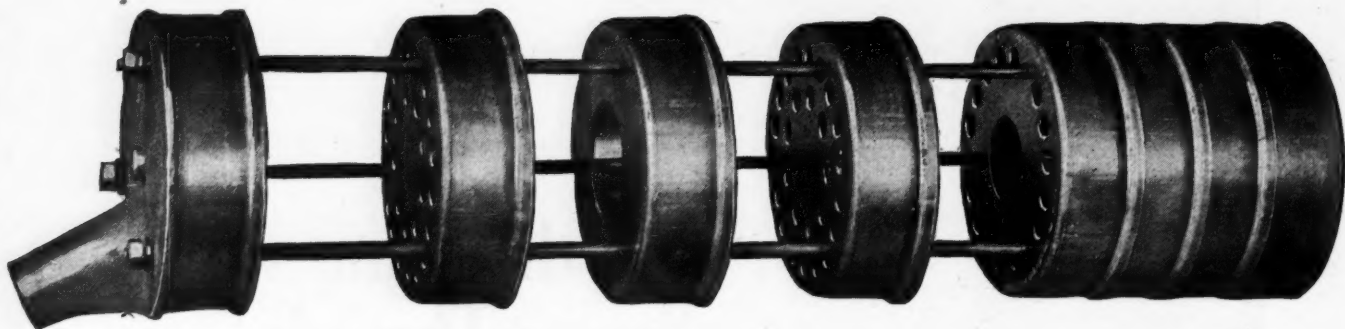
Branch Office:
9-10 Water Lane, Queen
Victoria St.,
LONDON, ENG.

AGENTS: France, Spain and Belgium—F. Aubert & Co., 182 Rue Lafayette, Paris. Holland—Spillehoff, Beeuwkes & Co., Rotterdam. Japan, Korea, Manchuria and Formosa—Mitsui & Co., Ltd., Tokio. Australia—McPherson's Pty., Ltd., 554 Collins St., Melbourne. Sweden—A. Bol Oscar Lindbom, Post Box 420, Stockholm.



HARTNESS SCREW THREAD COMPARATOR

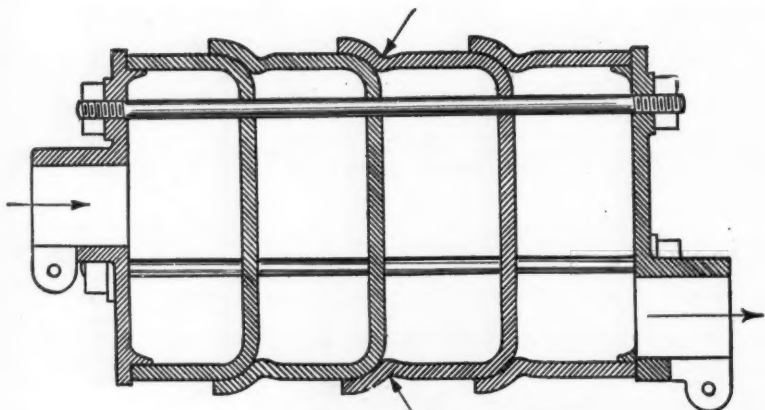
POWELL MUFFLER—BLOW-OUT PROOF



Have a ride down the exhaust pipe with me into the muffler. I am red hot steam and gas and fire. I come from any automobile engine.

I go into the muffler, some mufflers I blow up, some I rust out, some I loosen the insides, for I am made of hot stuff.

I find the Powell Mufflers will last the longest. I have tried and tried to bust and rust them, but they are made too strong. They always make the pipe from the engine strong, but some put on very light mufflers for me to bust. I like a muffler that will last a long time, that does not choke up, blow out or rust out. But many car makers put on a muffler because they are cheap; they should ask me—I am the exhaust from any automobile engine.



This is a Section of the Powell Muffler

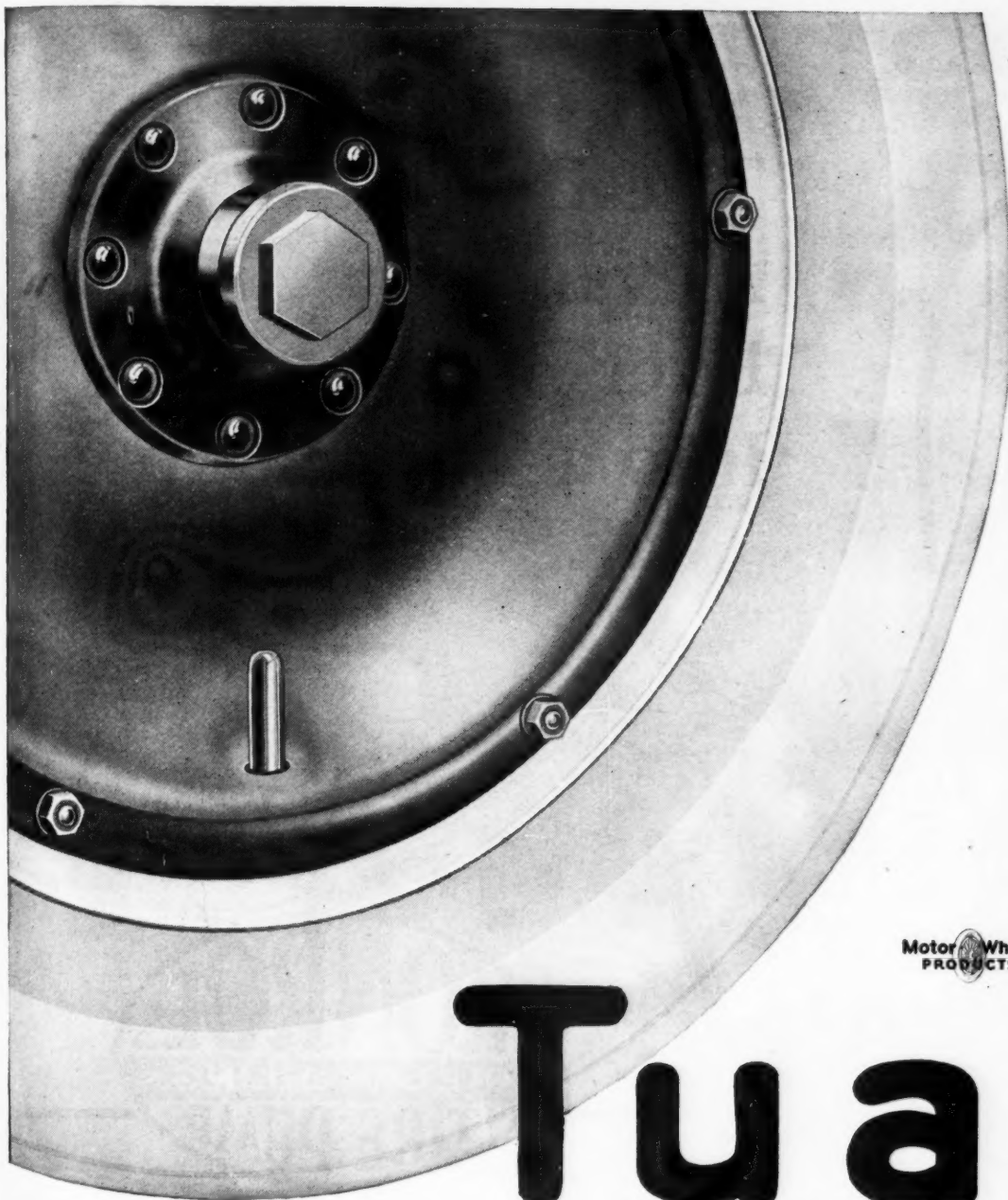
Standard Equipment on the following cars and trucks:

Autocar Co.	Fifth Ave. Coach Co.
Brockway	Stewart Motor Truck Co.
Nordyke & Marmon Co.	H. H. Franklin Mfg. Co.
Packard Trucks	F. B. Stearns Co.
White Motor Co.	The Winton Company
Yellow Cab Co.	and many others

*Special mufflers for automobiles.
Special mufflers for replacement.
Special mufflers for trucks.
Special mufflers for speed wagons.
Cold Drawn Cups and Metal Tool Boxes.*

POWELL MUFFLER COMPANY

UTICA, NEW YORK



Motor Wheel
PRODUCTS

Tuarc

STEEL WHEELS

—a Motor Wheel Product



Tuarc wheels add strikingly to motor car attractiveness. Beautifully curved—they blend gracefully with body contour. Yet beauty is but one of the outstanding benefits conferred by Tuarcs.

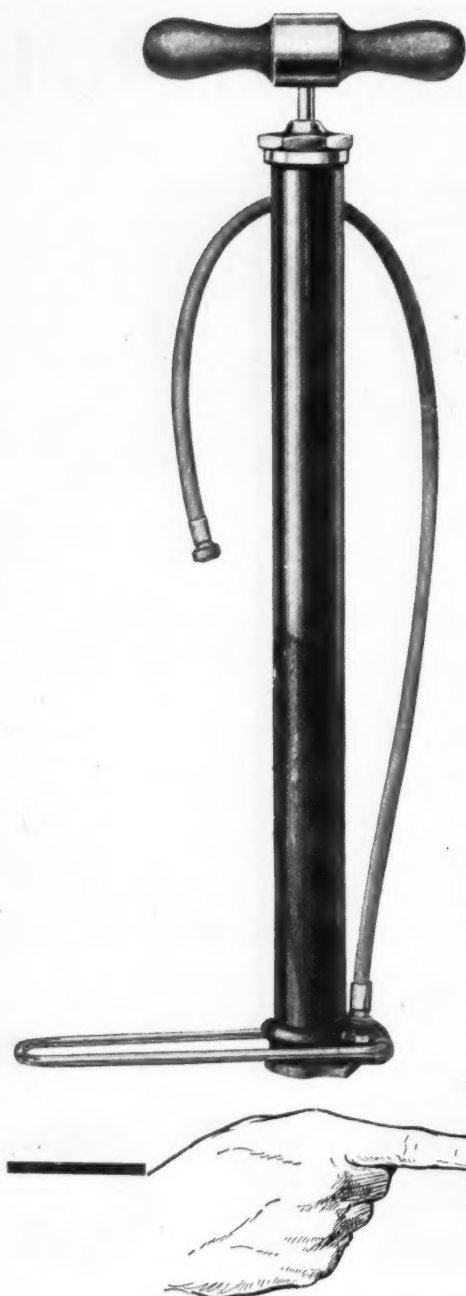
Wholly outside valve stems first made practical on steel wheels by Tuarcs, give complete accessibility for inflating tires. Demountable rims, indispensable for greatest convenience, do away with lifting whole wheels, and eliminate the necessity of extra wheel and special carrier. Hubs that fit without a single special part facilitate installation. Only Tuarcs embody all these advantages.

That is why these wheels are used as standard equipment by fourteen prominent manufacturers; why their dominance among steel wheels is steadily on the increase.

MOTOR WHEEL CORPORATION, LANSING, MICHIGAN

Motor Vehicle Wheels Complete—Metal Stampings—Steel Products

601 Capitol Theatre Bldg.,	120 Madison Ave., Detroit
509 Fisk Bldg., B'dw'y at 57, New York	Bigelow Blvd. & Craig, Pittsburgh
584 Commonwealth Ave., Boston	520 Van Ness Ave., San Francisco
10 South 18th St., Philadelphia	1341 So. Hope St., Los Angeles



The Biggest Advantage Ever Built Into a Tire Pump



HOW IT WORKS

The patented MONROE Self-Oiling Washer is located just above the valve leather. Before the pump is assembled, this washer is thoroughly impregnated with a leather preserving oil. On each up-stroke of the plunger the action of the valve spring compresses the washer and releases a very small amount of oil which is absorbed by the valve leather. The leather is thus kept so soft and pliant that it readily spreads on every down motion of the plunger, completely filling the barrel and assuring maximum compression. This proven principle of construction is an exclusive MONROE feature — no other tire pump has it.

Without doubt, the greatest improvement ever made in tire pump construction is the MONROE *patented* Self-Oiling Washer. For it has proven to be the one successful means of keeping valve leathers *permanently* lubricated.

Unless the valve leather of a tire pump is kept soft and pliant by proper lubrication, the pump is of little use in service. For it is the valve leather being forced against the inner surface of the barrel that causes compression, making it possible to deliver air to the tire.

This self-oiling feature alone has been the means of placing the MONROE in thousands of the best known motor cars as standard equipment. There are other advantages, too. Send for a sample MONROE. Compare it point for point with any other pump. You'll find it the logical pump to go in the car *you* build.

MONROE AUTO EQUIPMENT MANUFACTURING CO.

MONROE

MICHIGAN

The Fulton Company

Sales Representative to Jobbers Only

Milwaukee, Wis.

STANDARD EQUIPMENT IN MANY LEADING MOTOR CARS

Front Axles

and **TIMKEN** *Tapered* **ROLLER BEARINGS**

The overwhelming dominance of Timken Tapered Roller Bearings in front wheel mountings is conclusive evidence of the correctness of Timken design and construction.

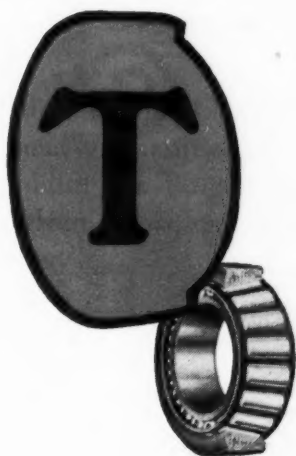
Specifically Timken design means

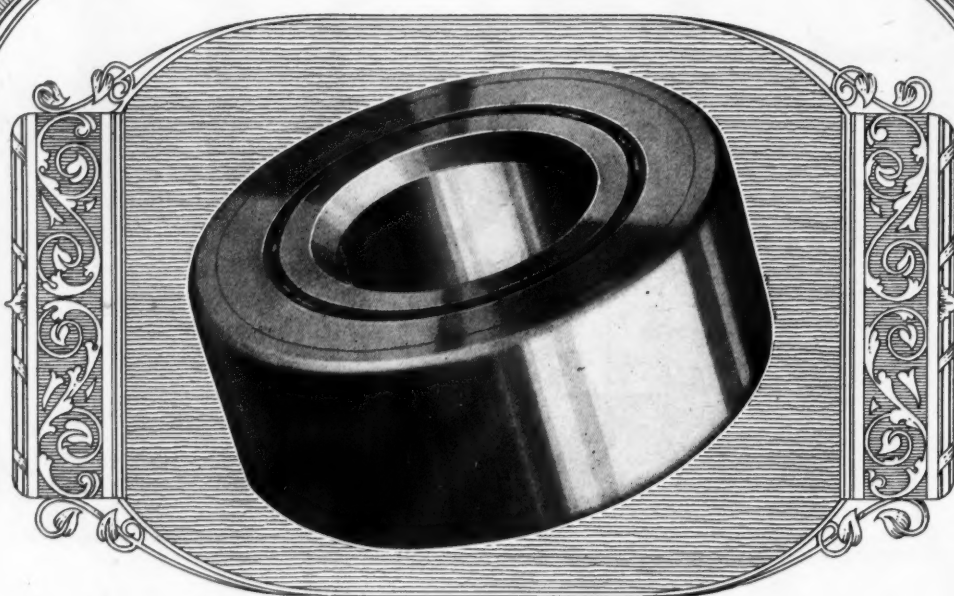
the ability to carry all loads—radial loads, thrust loads, and resultant loads—continuously and simultaneously at required speeds—

the capacity to carry more load, size for size, than any other type of bearing—

the possibility of being easily and quickly adjusted when the wear which *must* follow motion does occur, and made to function as when new.

Timken Bearings mean light, simple, compact hubs—an initial saving both to maker and user; and snug, true running, nice-steering front wheels—a final saving and a great comfort to the user in particular.





New Departure Ball Bearings

"The perfection of an art consists in the employment of a comprehensive system of laws commensurate to every purpose within its scope, but concealed from the eye of the spectator; and in the production of effects that seem to flow forth spontaneously, as though uncontrolled by their influence and which are equally excellent whether regarded individually or with reference to the proposed result."

The governing policies in the manufacture of New Departure Ball Bearings could not be more concisely stated than by this writer. When it comes to producing a mechanical device for fighting off and nullifying the evils of friction, the ball type of bearing approaches most closely to absolutely perfection.

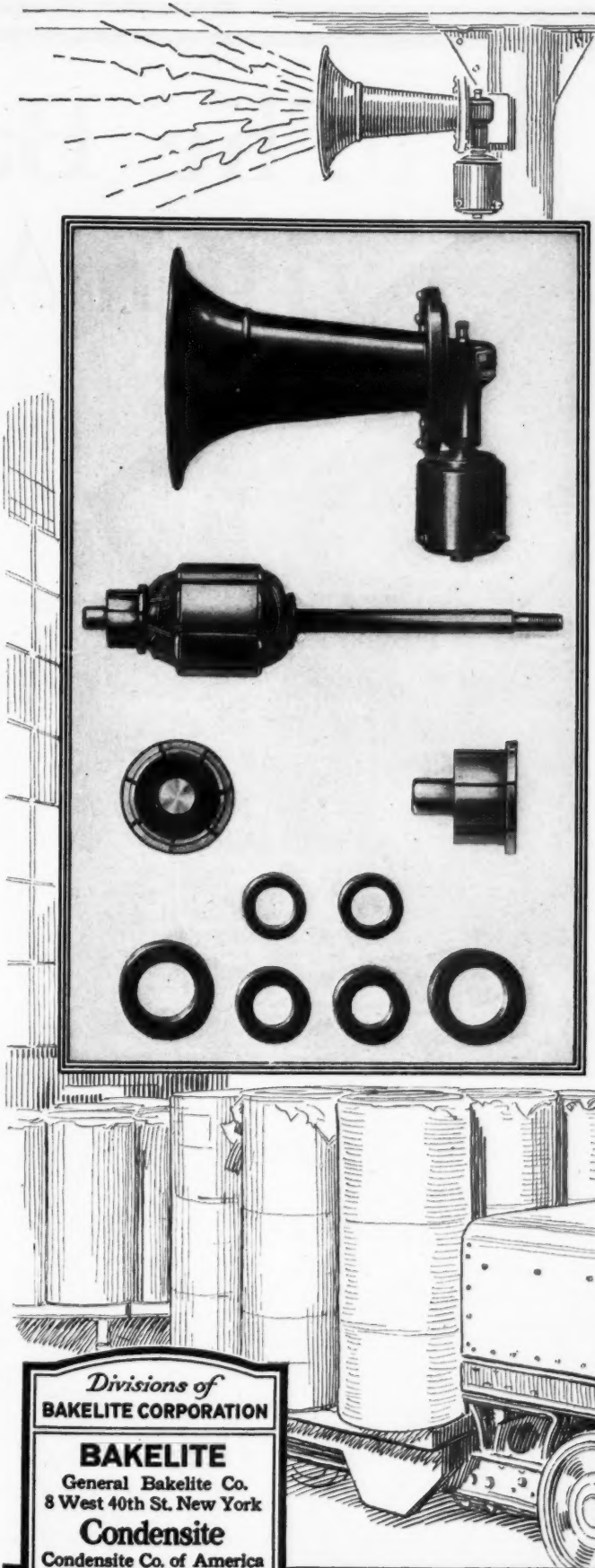
New Departure Ball Bearings are used in practically every make of American motor cars.

THE NEW DEPARTURE MANUFACTURING
COMPANY

DETROIT

Bristol, Connecticut

CHICAGO



Standardizing a product in the plans

A long steady series of heavy vibrations—electrifying, penetrating, far reaching. . . . This was KLAXON, a new sound.

A small, compact, and easily operated device, for automobiles, industrial trucks, fire alarm and call systems, and, in France, for "gas alarms" . . . this was the Klaxon horn.

The public received it at once. Careful planning and construction backed up an efficient sales campaign and gave the buyer a finished article that needed no apology.

The faithful performance of Klaxon has been dependent upon the faithful performance and dependability of the materials of which it is made. In planning Klaxon they specified a Condensite molded commutator, Condensite impregnated armature, and Condensite-Fibre (moisture proof) insulating washers.

Condensite, like Bakelite and Redmanol, has proven a boon to the designing engineer through providing a standardized material of a thousand uses.

BAKELITE CORPORATION

Address the Divisions

Each Company maintains a research laboratory which will gladly co-operate with manufacturers in the working out of new applications.

Divisions of BAKELITE CORPORATION

BAKELITE

General Bakelite Co.
8 West 40th St. New York

Condensite

Condensite Co. of America
Bloomfield, N. J.

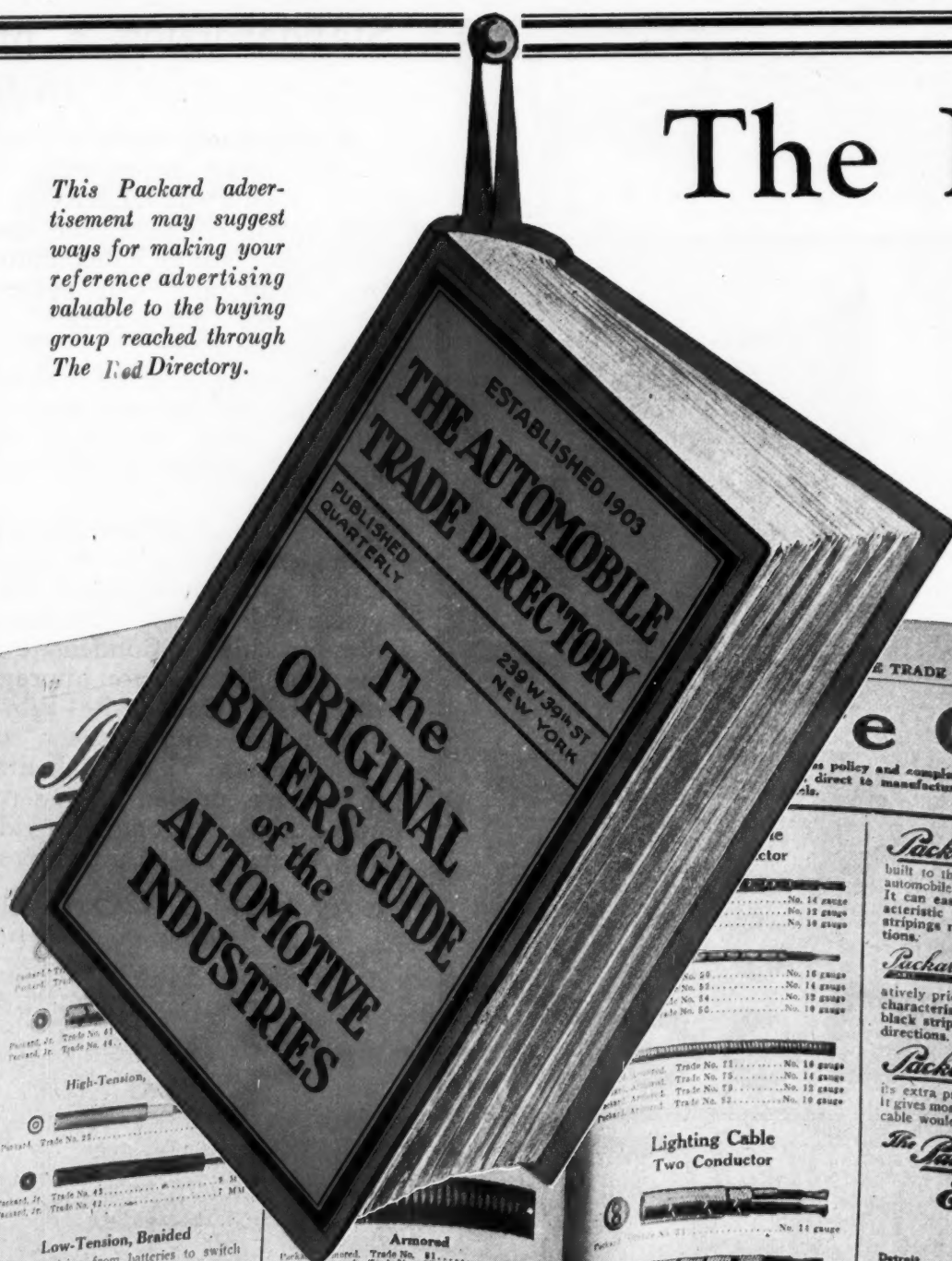
REDMANOL

Redmanol Chemical
Products Co.
636-678 West 22nd St.
Chicago, Ill.

The Material of a Thousand Uses

This Packard advertisement may suggest ways for making your reference advertising valuable to the buying group reached through The Red Directory.

The Bac Au



TRADE DIRECTORY

e Cable

policy and complete merchandising program direct to manufacturers. Distributed through

Packard Cable, from the selection of the wire to the final application of the enamel, is built to the highest standard and is the most reliable automobile cable that it is possible to make. It can easily be distinguished by its characteristic seal-brown color, with two black stripings running spirally in opposite directions.

Packard Jr. Cable closely parallels the Packard line in style and size, but is more economical and is actively priced. It is readily identified by its characteristic seal-brown color, with two black stripings running spirally in opposite directions.

Packard Armored Cable is preferred to ordinary braided cable on account of its extra protection against mechanical injury. It gives most satisfactory service where other cable would not stand up at all.

The Packard Electric Company
Warren, Ohio

DISTRICT OFFICES
Detroit
New York
Chicago
782 David Whitney Building
461 Eighth Avenue, at 34th St.
431 South Dearborn Street
REPRESENTATIVES
Montreal
Atlanta
Minneapolis
Fort Dodge
Kansas City
Dallas
Denver
Seattle
San Francisco
Humboldt Canadian Electric Co.
C. E. Althoff Company
J. E. Davis Company
Frank W. Lynn
Duncan Reed Company
R. E. Voorhees
Paul Gardiner

Please send me a copy of your Bulletin as advertised in issue of October, 1922. Also a sample of

Trade No.
Name
Address
Company

Please Mention The Automobile Trade Directory

High-Tension,
Packard, Trade No. 25..... 5 MM
Packard, Jr. Trade No. 43..... 5 MM
Packard, Jr. Trade No. 42..... 7 MM

Low-Tension, Braided
Used in wiring from batteries to switch and switch to coil
Packard, Trade No. 25..... 5 MM
Packard, Jr. Trade No. 43..... 5 MM
Packard, Jr. Trade No. 47..... 5 MM
Packard, Jr. Trade No. 49..... 5 MM

Low-Tension, Plain
Packard, Jr. Trade No. 45..... 5 MM
Packard, Jr. Trade No. 46..... 5 MM

Portable Cord
Packard, Jr. Trade No. 48..... 5 MM
Specify by Trade Numbers

Please Mention The Automobile Trade Directory

Armored
Packard, Armored, Trade No. 81..... 14 gauge
Packard, Armored, Trade No. 82..... 14 gauge
Packard, Armored, Trade No. 101..... 14 gauge
Packard, Armored, Trade No. 102..... 14 gauge
Packard, Armored, Trade No. 103..... 14 gauge
Packard, Armored, Trade No. 104..... 14 gauge
Packard, Armored, Trade No. 105..... 14 gauge
Packard, Armored, Trade No. 106..... 14 gauge
Packard, Armored, Trade No. 107..... 14 gauge

Battery Charging Cable
Plain Acid Proof
Packard, Plain Acid Proof, Trade No. 108..... 14 gauge
Packard, Plain Acid Proof, Trade No. 109..... 14 gauge

Spot Light Cable
No Outside Braid
Packard—No Outside Braid, Trade No. 110..... 14 gauge
Packard—No Outside Braid, Trade No. 111..... 14 gauge

With Outside Braid
Packard—With Outside Braid, Trade No. 112..... 14 gauge
Packard—With Outside Braid, Trade No. 113..... 14 gauge
Specify by Trade Numbers

Lighting Cable
Two Conductor

Packard, Trade No. 21..... 14 gauge
Packard, Trade No. 22..... 14 gauge
Packard, Trade No. 23..... 14 gauge
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Armored
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Packard, Armored, Trade No. 98..... 14 gauge
Packard, Armored, Trade No. 99..... 14 gauge
Packard, Armored, Trade No. 100..... 14 gauge

We have just published a new bulletin on the subject of Automotive Cable which you will find to be of considerable assistance in making proper application of the many different styles of cable required in this work.

Specify by Trade Numbers

Backbone of Automotive Advertising

and How to Use It

THE selling campaign that disregards Reference Advertising is seriously without a backbone.

Very few advertisers can afford big space in every issue of every important trade magazine. And in disregarding Reference Advertising, that is precisely what would be necessary in order to provide complete buying information for all prospects at all times. Because of the character of general advertising it obviously must be "come and go—here today and gone tomorrow."

But reference advertising is *permanent*.

If you could afford but *one* advertisement—a lasting advertisement that would reach 98% of the buyers of the industry and be referred to continually—you would use The Red Directory.

And if you could afford any amount of advertising—you would have an even bigger use for The Red Directory.

As a reference medium, The Red Directory supplements all your other advertising. And conversely—it is the vital backbone of all your advertising.

To use this advertising to best advantage, make it completely informative. Give the buyer all the information he needs in order to place an order—for that is why he consults the reference medium. Make it, as nearly as possible, a complete catalog for your automotive products.

And in all your other advertising refer to this catalog in The Red Directory. That gives a backbone and finality to your entire selling program. And it will lead to better business for you.

THE AUTOMOBILE TRADE DIRECTORY

"THE RED DIRECTORY"

239 West 39th Street

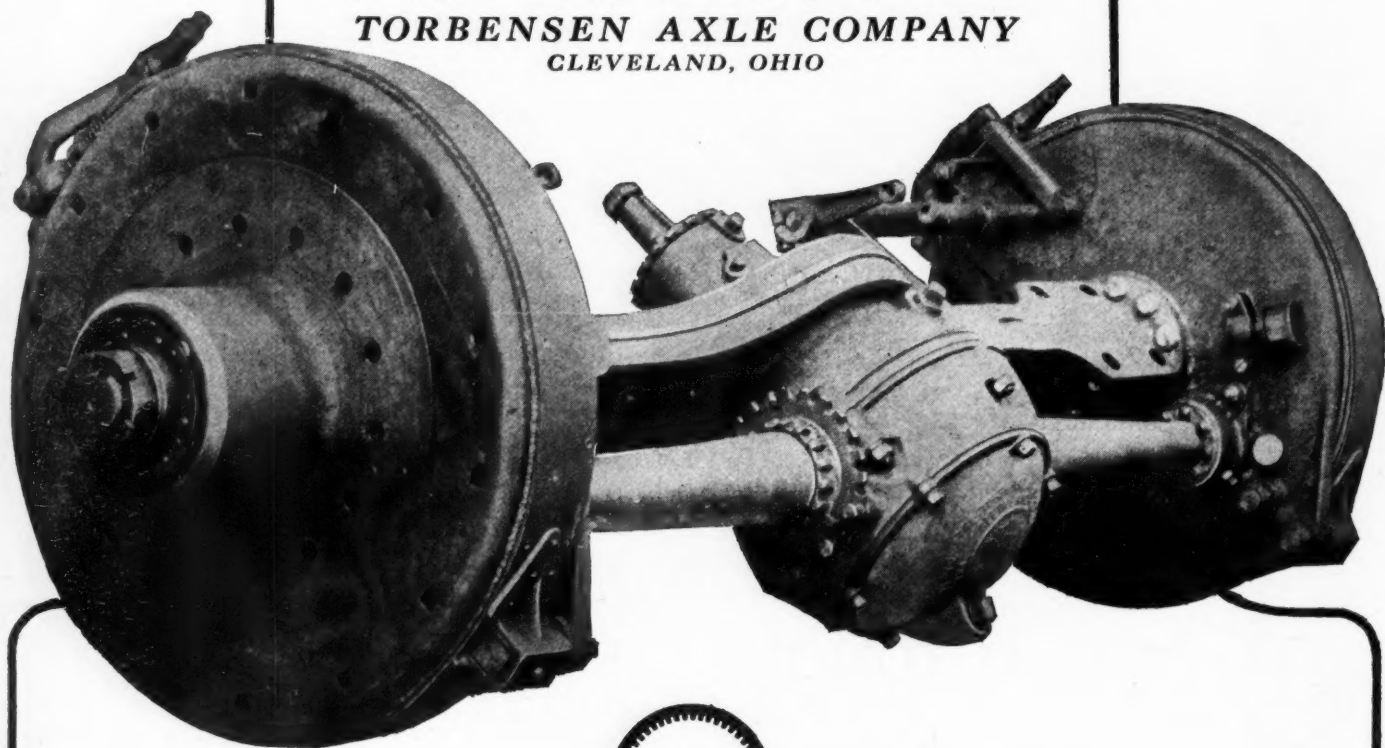
New York City

The Original Directory of the Automotive Industries

TORBENSEN AXLES

Precisely the same features which have won Torbensen pronounced leadership in the light truck field, make it a better axle, also, for heavy duty trucks. It transmits more motor power to the driving wheels. It is the strongest axle, for a given capacity, built, as well as the lightest weight. It is much more simple in construction, and stands up better and longer. It is fully protected against dust, grit, and dirt.

TORBENSEN AXLE COMPANY
CLEVELAND, OHIO



ANALYZE YOUR PRODUCTION SCHEDULES



Breakfast at the William Penn



"I'M stopping at the William Penn," said Riggs as Bronson and himself stepped out of the sleeper in Pittsburgh. "Have breakfast with me."

"All right," answered Bronson. "It beats all how eating makes one hungry. I've been feasting for several days now."

"Why all this fancy eating?" asked Riggs as they crawled into a taxi.

"Oh, I was up to the plant and we gave the old man a party. He's been grinding away there now for exactly fifty years."

"It's always interesting to know a man who has devoted his life to a task," said Riggs, a little later as the pair sat at a table.

"Usually a man stays because he likes the job, and he usually does well what he likes to do. A fine example of that is the Russell, Burdsall & Ward organization, bolt, nut and rivet people at Port Chester—you've heard of them. There's upwards of a hundred people in that plant who have been there more than 30 years. There's one man who has been on the job for 66 years, and a goodly group that has been there over 50 years."

"Yes, I know the concern," said Bronson. "I was purchasing agent for a little plant in Indiana when I first heard of Russell, Burdsall & Ward. We used to have a deuce of a time finding a dozen good nuts until we got acquainted with R. B. & W."

"I thought all nuts were alike," said Riggs.

"All Empire nuts are," said Bronson. "That's R. B. & W.'s trademark. They developed machinery to make nuts automatically perfect. A batch of bad nuts sure can break down the production schedule in any plant that uses many."

"Just how?" asked Riggs.

"Oh, it isn't the cost of the nut itself," answered Bronson. "It's the time the workman loses in trying on bad ones, but—"

"Here give me that check," said Riggs. "I invited you to breakfast. You know that nut dope rather interests me. I'm a stockholder in a little plant that may be overlooking something. I must make a memorandum on it—let's see, Russell, Burdsall & Ward, Empire nuts, Port Chester, N. Y.—there, that's done. Well, let's go."

RUSSELL, BURDSALL & WARD

BOLT & NUT COMPANY

PORT CHESTER, N.Y.

PEMBERWICK, CONN. • CHICAGO • SAN FRANCISCO • ROCK FALLS, ILL.

Makers of Bolts, Nuts and Rivets Since 1845



Tapping open
hearth furnace



Today Are You Studying Your Problem in Steel?

Many manufacturers of products made of steel know, in a general way, that Agathon Alloy Steel is the superior of straight carbon steel for various constructional purposes. Questions beyond that they have set aside "to be investigated later."

Why not investigate now? Would a good alloy steel benefit *your* product? What exact analysis of alloy steel would be best? What heat treatment would be necessary? Would an alloy steel fit into your general scheme of machining, assembly, etc?

We can give you quickly and accurately just the information you will require to answer these questions and will be glad to do so on request. Send for interesting booklet—"Agathon Alloy Steels."

We have a daily production in all kinds of commercial alloy steels such as—

Nickel, Chrome-Nickel, UMa, Molybdenum, Chrome-Molybdenum, Nickel - Molybdenum, Vanadium, Chrome-Vanadium, Chromium, etc.

Deliveries in Blooms, Billets, Slabs, Bars, Spring Flats, Hot Rolled Strips, etc.

THE CENTRAL STEEL COMPANY, Massillon, Ohio

SWETLAND BLDG.
CLEVELAND

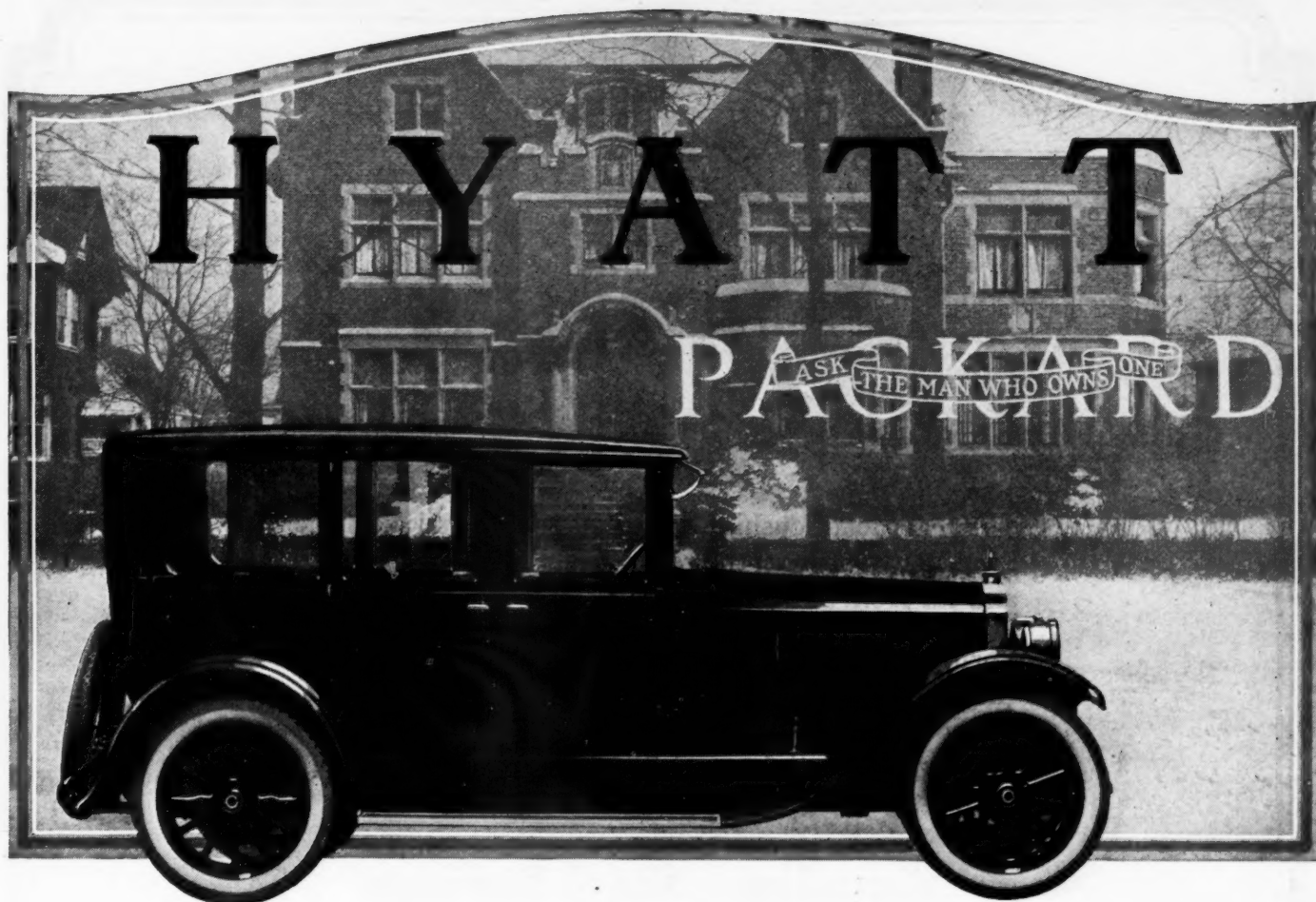
BOOK BLDG.
DETROIT

PEOPLES GAS BLDG.
CHICAGO

UNIVERSITY BLOCK
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WIDENER BLDG.
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AGATHON ALLOY STEELS



FOR more than 20 years the name "Packard" has been indelibly linked with all that is finest and best in automotive manufacture. Proud of such priceless reputation, Packard has jealously and consistently maintained a standard that has known no compromise with traditional Packard quality and character.

Since quality invariably seeks the association of quality, it is most fitting that the Packard Light Six should employ the services of Hyatt Roller Bearings.

Used in the transmission and on the shaft of the fan and pump unit Hyatt Roller Bearings assure for the entire life of this long-lived Packard car a most satisfactory bearing performance.

HYATT ROLLER BEARING COMPANY

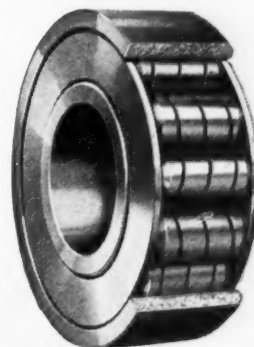
Motor Bearings Division: Detroit, Michigan

*Tractor Bearings Division
Chicago, Ill.*

*Pacific Coast Division
San Francisco, Cal.*

*Industrial Bearings Division
New York, N. Y.*

*A Hyatt bearing with
part of outer race re-
moved to show the
spiral rollers.*



HYATT QUIET BEARINGS

Springs

carry the load, cushion the road shocks, take up the driving thrust from the rear wheels and protect riders and car from bumps and jars.

Springs must combine rigidity and flexibility in just the right proportion. They must have strength, elasticity and toughness to give them a high degree of resistance to fatigue, and to enable them to stand up without settling.

Vanadium Steel Springs

outride and outlast carbon steel springs. The high elastic limit of Vanadium Steel and its great toughness insure longer spring life. The well-known fatigue-resisting qualities of Vanadium Steel are the best assurance of long and dependable spring service.

Write for data on the strength, greater factor of safety and service life of Vanadium Steel Springs.

Vanadium Corporation of America
New York *Detroit*

VANADIUM STEELS

for Strength, Toughness and Durability



REAMERS

To justify their association with the Whitman & Barnes drills, Whitman & Barnes reamers must measure up to extraordinary requirements in the way of enduring quality.

In every possible respect these Whitman & Barnes reamers are worthy of their relationship to Whitman & Barnes drills which hold world's records, and which have established entirely new standards in drilling production.

Manufacturers who have once experienced the amazing efficiency of either Whitman & Barnes drills or reamers, insist upon being continuously supplied with both.

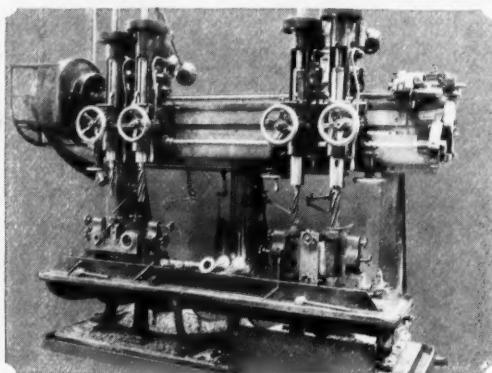
The Whitman & Barnes Mfg Co
Akron, Ohio





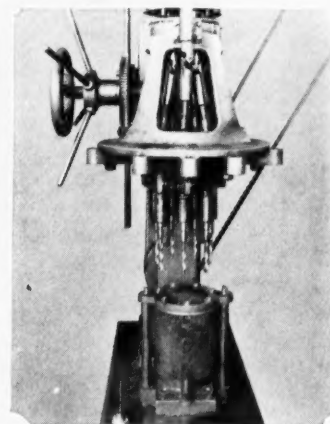
Holt **CATERPILLAR** Tractors

Reg. U.S. Pat. Off.



CAST steel track links, for Holt Tractor, are S. A. E. 1235, 2 1/4 inches thick. By the use of Whitman & Barnes high speed, three groove, one and three-eighths and two and seven-sixteenths drills, a production of 20 pieces an hour is maintained, re-grinding drills but once each day.

INDICATIVE of general production efficiency these cylinders are drilled and handled from floor to floor in 1 1/4 min. The prime factor in this notable rapidity of production is the Hercules 3/4-inch drill used.



THE astonishing power and rugged durability of the Holt caterpillar tractor have long since attracted the attention of the whole world.

It is no slight distinction in itself to be identified as an important element in the production of this great machine.

It is an even greater distinction to be regarded as a production asset, and the basis of a substantial dollars and cents saving.

Whitman & Barnes are naturally well pleased that they are able so successfully to serve this distinguished company.

Here again is an occasion where Whitman & Barnes technical service is rendered with marked advantage, and where Whitman & Barnes drills and reamers perform with superior efficiency.

The same close co-operation that lowers shop costs for Holt, is available to every twist drill user.

"W & B" Warehouses

61 Reade Street, New York City
565 W. Washington St., Chicago, Ill.
139 Queen Victoria St., London, E. C. 4

Whitman & Barnes

AKRON, OHIO

Manufacturers of TWIST DRILLS AND REAMERS Exclusively

The ability of Fabroil Gears to resist destructive elements is only one of their many remarkable properties



Let Service Tests Speak for Themselves

We have repeatedly claimed that Fabroil Gears lengthen the life of machinery and silence operation, and that they wear better than iron.

But don't be content to accept these statements. Test the gears yourself. Others have done it and become enthusiastic about them. When you have seen one of them at work you will also be convinced of their superior qualities.

Many leading machinery manufacturers and users now specify Fabroils as standard equipment. And you cannot afford to overlook the economies and other advantages to be gained.

There's a size to suit your needs—for driving coffee mills or for transmitting hundreds of horsepower. Standard blanks can be shipped from stock.

*Ask the G-E Sales Office nearest you
for complete information.*

*Two Fabroil Pinions driving
tumblers in foundry.*

**General  Electric
Company**

General Office
Schenectady, N.Y.

Sales Offices in
all large cities

U-LOY STEELS

Making travel comfortable in automobiles

Imagine!—twenty years ago—Saturday afternoon—ten miles to town. A farm wagon—rough roads, and—jolt! jolt! jolt! What a discomfort!

Not so today. In automobiles, traveling is now a pleasure and The Mather Spring Company, of Toledo, Ohio, has done much to make it so. Roads may be rough but Mather Springs take up the jolts. Possessing flexibility and life in the highest degree, they cushion the bumps, make riding comfortable and enable tires to give long wear. The unusual satisfaction these springs give can be a result of only two things: correct design and correct steel rightly heat treated. That steel is U-LOY.

Your product may require steel of highly elastic qualities as here—or exceptional strength—or unusual toughness. No matter what it may be, our metallurgists will work with you to determine the U-LOY Steel you need.

UNITED ALLOY STEEL CORPORATION
Canton, Ohio

New York
Syracuse
Cleveland

Chicago
Detroit
Buffalo

San Francisco
Indianapolis
Portland

Open Hearth and
Electric Furnace
U-LOY Steels are
furnished in:—

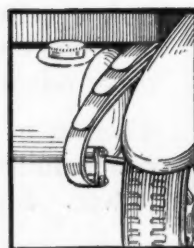
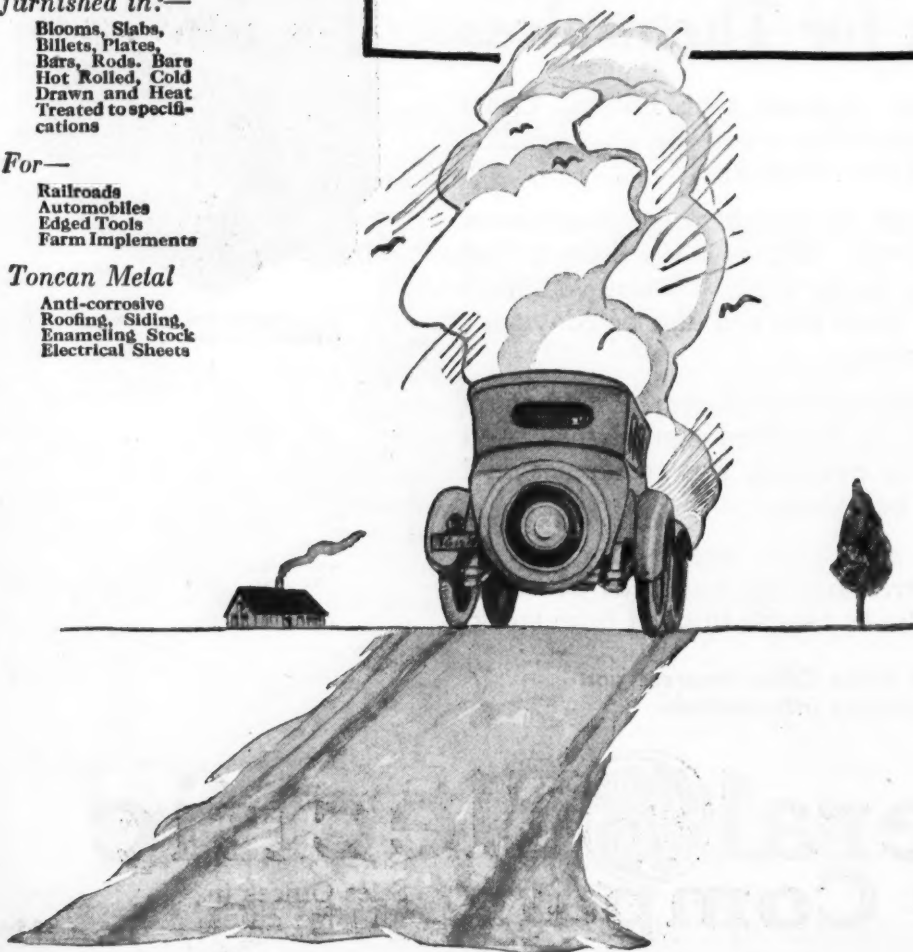
Blooms, Slabs,
Billets, Plates,
Bars, Rods, Bars
Hot Rolled, Cold
Drawn and Heat
Treated to specifications

For—

Railroads
Automobiles
Edged Tools
Farm Implements

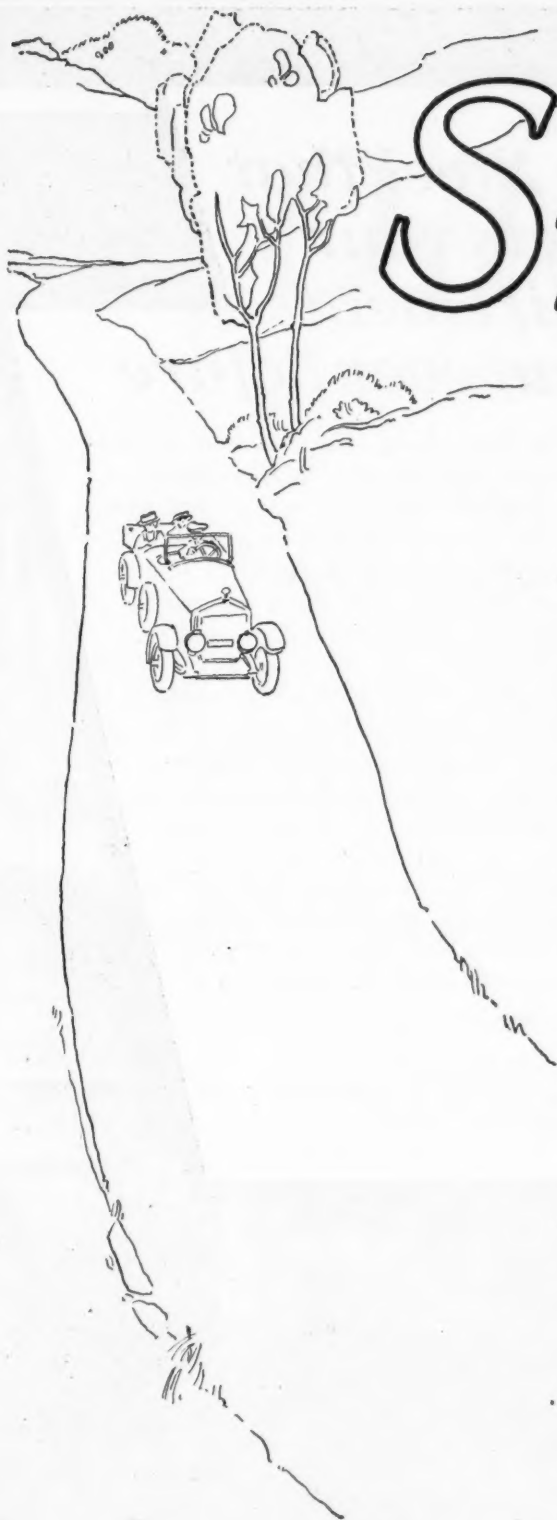
Toncan Metal

Anti-corrosive
Roofing, Siding,
Enameling Stock
Electrical Sheets



MATHER SPRINGS

Give cars remarkably easy riding qualities. Made of U-LOY Steel.



Smooth

Like a well-built car on new asphalt, a genuine Morse Chain performs *smoothly*.

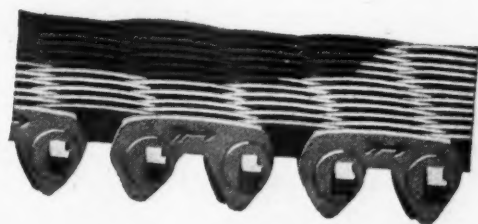
The specially shaped Morse links, operating on the exclusive "rocker-joint" principle, bring about this happy result. They mesh with the sprockets with a rolling motion that reduces friction and operates silently.

They drive cam and accessories the way you like to see production going.

MORSE CHAIN COMPANY

Main Office and Works
ITHACA, NEW YORK

Sales and Engineering Office
DETROIT, MICHIGAN



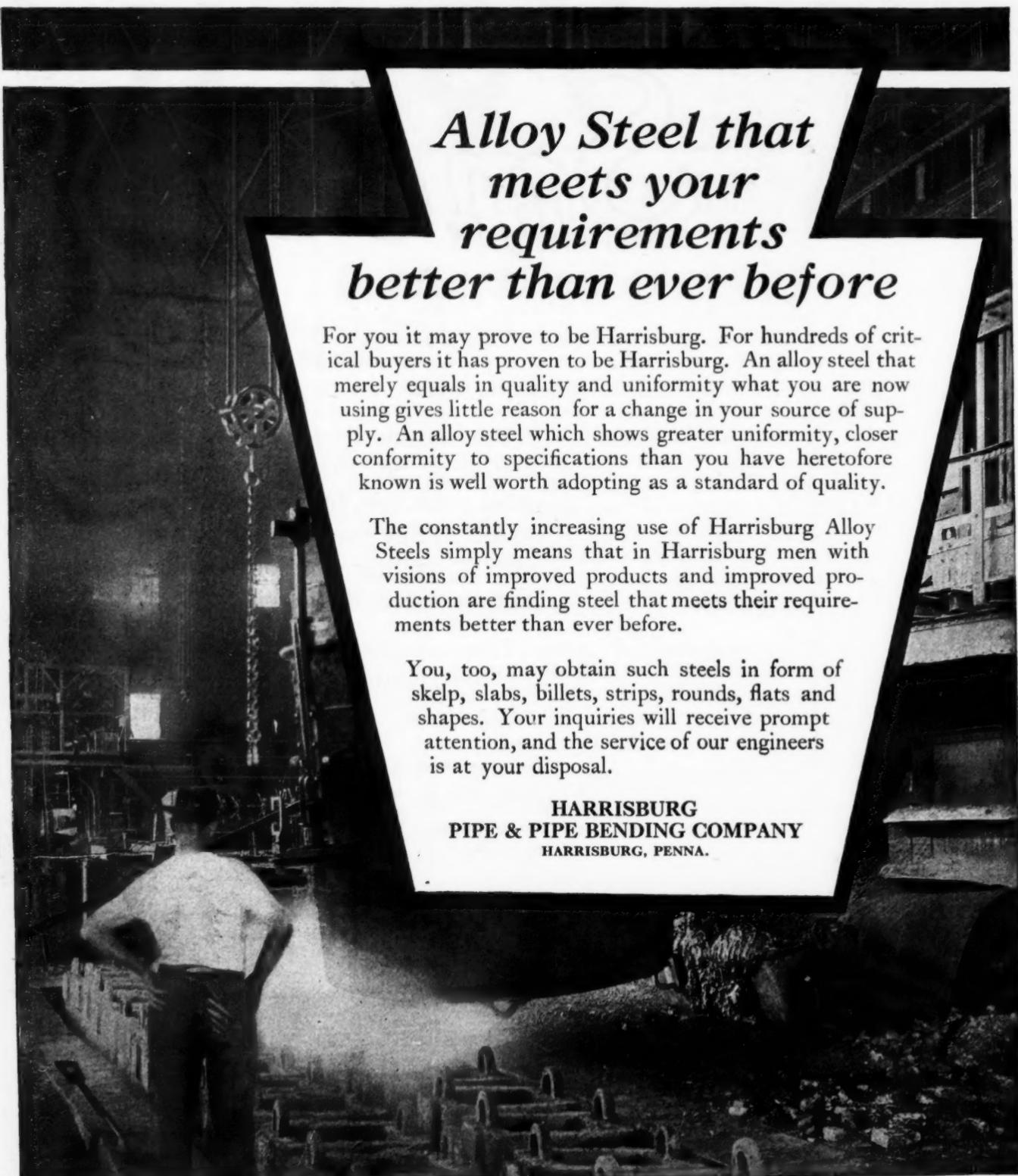
MORSE

GENUINE

SILENT

CHAINS





*Alloy Steel that
meets your
requirements
better than ever before*

For you it may prove to be Harrisburg. For hundreds of critical buyers it has proven to be Harrisburg. An alloy steel that merely equals in quality and uniformity what you are now using gives little reason for a change in your source of supply. An alloy steel which shows greater uniformity, closer conformity to specifications than you have heretofore known is well worth adopting as a standard of quality.

The constantly increasing use of Harrisburg Alloy Steels simply means that in Harrisburg men with visions of improved products and improved production are finding steel that meets their requirements better than ever before.

You, too, may obtain such steels in form of skelp, slabs, billets, strips, rounds, flats and shapes. Your inquiries will receive prompt attention, and the service of our engineers is at your disposal.

HARRISBURG
PIPE & PIPE BENDING COMPANY
HARRISBURG, PENNA.

HARRISBURG
ALLOY STEELS

Oil-Vac

[A KINGSTON PRODUCT]

A Step Forward in Vacuum Fuel Feeding Systems

THE KINGSTON VACUUM FUEL FEEDING SYSTEM differs from other types in that the vacuum is not taken from the manifold, but is produced from oil pump suction. While we do not contend that this departure is revolutionary, automotive engineers who have investigated *Oil-Vac* agree with us that it is an important step forward.

Oil-Vac, the new system, does away entirely with the intake manifold as a suction source. Briefly it consists in utilization of the suction produced by a properly proportioned oil-circulating pump.

With the *Oil-Vac* system there is the certainty of increased suction with increased engine speed. When the greatest amount of

fuel is needed, as on long grades and at high speeds, the greatest amount is actually being delivered.

In the case of *Oil-Vac*, since there is no connection with the manifold, there is no disturbance of carburetion.

With *Oil-Vac*, since the vacuum is created by the circulating oil pump of the motor, an absence of oil causes the vacuum tank automatically to cease to function—a warning device that every motorist will appreciate.

With *Oil-Vac*, crank case dilution is materially lessened, oil runs cooler and lubricates more efficiently.

These are a few of the points of superiority in *Oil-Vac*. Watch for the full story as it appears in this publication.

NO OIL—NO VAC—

No Gas

With Oil-Vac the vacuum ceases to exist when the oil supply becomes exhausted. This constitutes a factor of safety that automobile builders and motorists have long desired.

BYRNE, KINGSTON & CO., KOKOMO, IND.

BRANCHES:

New York, 243 West 55th Street
Chicago, 1430 Michigan Avenue

Detroit, 4610 Woodward Avenue
Boston, 15 Jersey Street
San Francisco, 32 Van Ness Avenue

A Certain Car Manufacturer



wanted a feed system he could depend upon to take his car where it was going and bring it back. A system that both owners and dealers would be perfectly satisfied with. He chose the Stewart Vacuum System.

He wanted a speedometer that was absolutely reliable and accurate; that would register correct speed from the first turn of the wheel without vibration, without noise. An instrument of quality appearance, fine workmanship.

He chose the Stewart Magnetic Speedometer. What else was there to do? Ninety per cent of manufacturers have done likewise.

All Stewart-Warner Products are backed up by exclusive Service Stations throughout the world.

STEWART-WARNER SPEEDOMETER
CORPORATION
CHICAGO U. S. A.



Stewart Model 131



Warner De Luxe Model 72



Van Sicklen Standard Model

Stewart
PRODUCTS
USED ON 8 MILLION CARS

A Letter from C. C. Bradley & Son,
Inc., Manufacturers of The
Bradley Cushioned Power
Hammers

Syracuse, N.Y. February 2, 1922

Selflock Nut & Bolt Company
East Syracuse, New York

Gentlemen:

On June 1, 1921, a Bradley Hammer was equipped with Selflock Nuts. For weeks the hammer was operated eight hours per day at a speed of 400 R.P.M. and a rigid inspection found the nuts tight.

As the result of tests made, all our hammers are being equipped with Selflock Nuts.

Very truly yours,

C.C. BRADLEY & SON, Inc.

FLS/M

No Form of Vibration Has Been Discovered That Will Jar Selflock Nuts Loose.

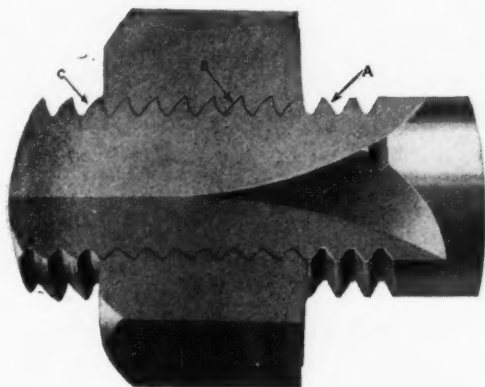
ASIDE from the indisputable holding qualities of Selflock Nuts, brought so forcibly to light in the letter reproduced on this page—aside from double frog rail-road crossing tests—laboratory tests of the most intense character—

Aside from valid evidence and statements of tests that have proved, unmistakably and decisively, that Selflock Nuts cannot be jarred or shaken loose—aside from all this is their rare *economy* value.

One-piece—no extra parts—no lock washers—no extra lengths of bolt material—no extra locking devices—but a one-piece nut whose threads lock in a vise-like grip.

Selflock Nuts are not only sound in principle—but are unmistakably *Economical* in every respect.

We invite engineers to put Selflock Nuts to any test they may prescribe. Your inquiries will receive our very prompt attention.



U. S. Standard Thread

SELFLOCKING Screwthreads are equal in area and strength with Standard threads. They differ only in the shape of their cross section.

The depths, flats, top and bottom, widths of bases, and the number of threads per inch are exactly the same. The only difference is that the bases of the SELFLOCKING threads are to one side a few thousandths of an inch.

Selflock Thread U. S. Patents No. 1,250,748, No. 1,300,801

Although the contour of each type of thread is slightly changed, the bearing sides of both nut and bolt threads are in perfect contact, and each and every SELFLOCKING thread carries its proportion of the total load.

SELFLOCK nuts can be used many times without losing their efficiency, and their locking qualities remain intact if they are reversed after several times use one side down.

Selflocking Set Screws, Cap Screws, and Stud Bolts have Standard number of threads per inch and will frictionally lock in any properly standard threaded hole. Plain nuts will also lock on all Selflocking Screws and Studs.

SELFLOCK NUT AND BOLT CO.

INCORPORATED

EAST SYRACUSE - NEW YORK



THE practical way to go about the marketing of any worth-while automotive product is first to enlist the help of the trade. They can get your product to the consumer, quickly and economically.

But even if your product *is* worth-while you may find difficulty in getting the trade to accept it, until jobber and dealer are satisfied as to its salability.

There is no better way to acquaint the dealers and jobbers all over the country with the merits of your product than by advertising through the business magazines which they read. Find your strong selling points * and present them in a consistent advertising program.

The dealers and jobbers who read *Motor World* and *Motor Age* do three-quarters of the trade's entire business.

Advertising in these magazines will put you in touch with the men in the trade who can serve you best.

Rates and sample copies on request.

THE CLASS JOURNAL COMPANY

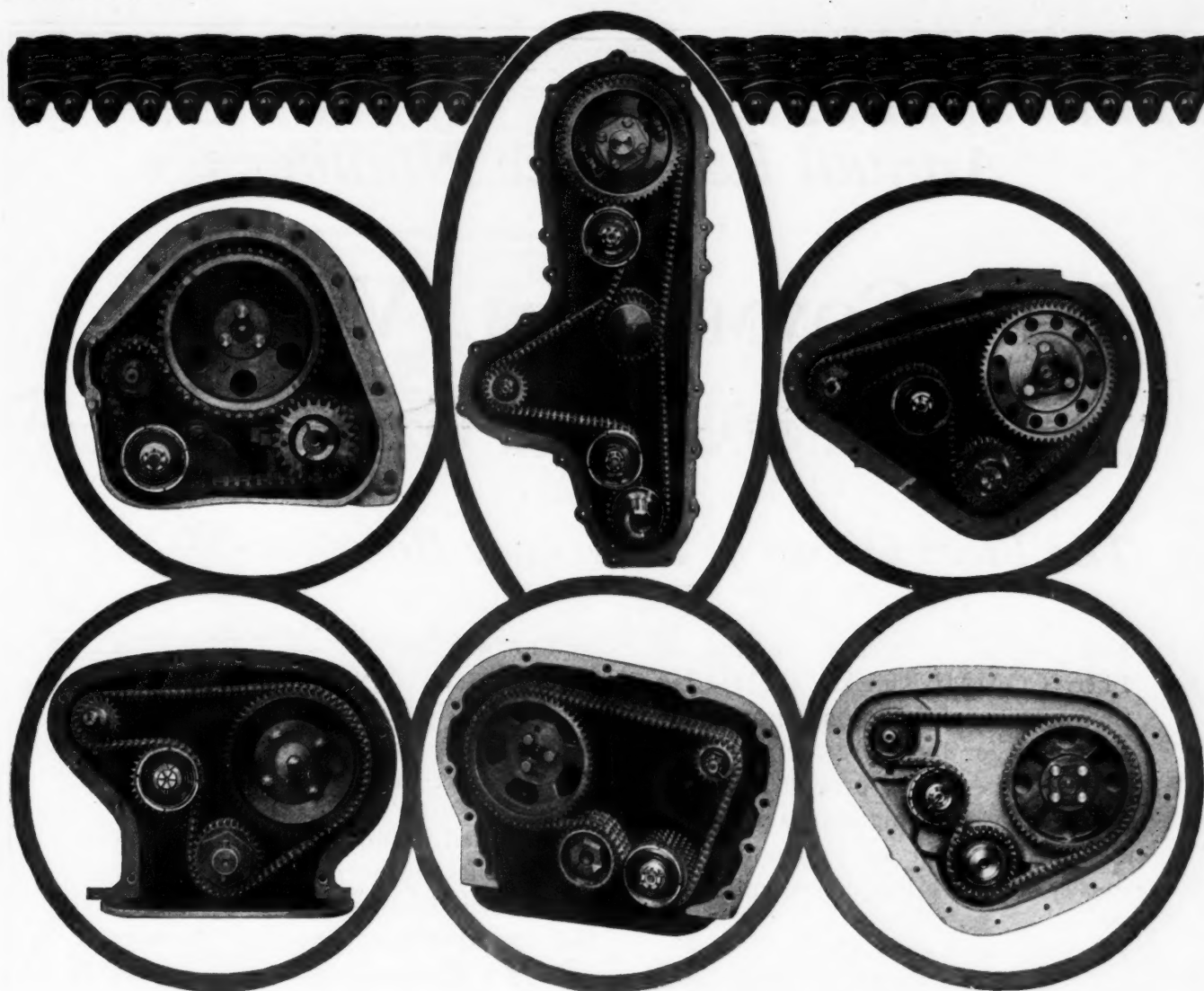
New York, U. P. C. Bldg.; Chicago, Mallers Bldg.; Boston, 185 Devonshire St.; Philadelphia, Widener Bldg.; Cleveland, Guardian Bldg.; Detroit, 317 Fort St., West; Indianapolis, 1212 Merchants Bank Bldg.

Publishers of AUTOMOTIVE INDUSTRIES, MOTOR WORLD, MOTOR AGE, COMMERCIAL VEHICLE, EL AUTOMOVIL AMERICANO, MOTOR BOAT, DISTRIBUTION & WAREHOUSING, THE TIRE RATE BOOK.

**The Merchandising, Research, and Advertising Service Bureaus of The Class Journal Co. can help you.*

Are you on our mailing list for "Facts and Information concerning the Automotive Distributing Field?"





ALL ARE QUIET-RUNNING ENGINES

- **ONE** of the great accomplishments in engine refinement is the quiet-running motor "front end."

Noisy gearing, just like hand cranking, has been superseded. Quiet-running is demanded by the car buyer. Automobile Engineers are meeting his wishes—and adding at the same time many unlooked for advantages. Link-Belt has produced the winning

combination—the Link-Belt Silent Chain and the famous Automatic Tightener. It keeps just the right operating tension on the chain at all times—automatically. Requires no hand adjustment.

You can build quiet-running into "front end" drive. Give the car-user something he has wanted but didn't know he could get.

LINK-BELT COMPANY, INDIANAPOLIS

1131

LINK-BELT

SILENT CHAIN FRONT END DRIVES

Annual Reference Number
of
THE COMMERCIAL VEHICLE
JANUARY 15th, 1923

The Fleet Owners' Reference Book for 1923

This annual reference number of THE COMMERCIAL VEHICLE (heretofore published on January 1st) will be larger and more complete than ever before. It will present a fund of constructive information to everyone identified with the use or sale of motor trucks, buses, trailers, parts and accessories.

Besides an exhaustive survey of conditions and accomplishments in the field during the past year, it will contain a forecast of the trend for 1923.

Complete specifications of gasoline and electric trucks, bus chasses and trailers on the American market will be published. All representative makes will be included.

This issue will present an opportunity, the value of which a great many manufacturers recognize. As a medium for

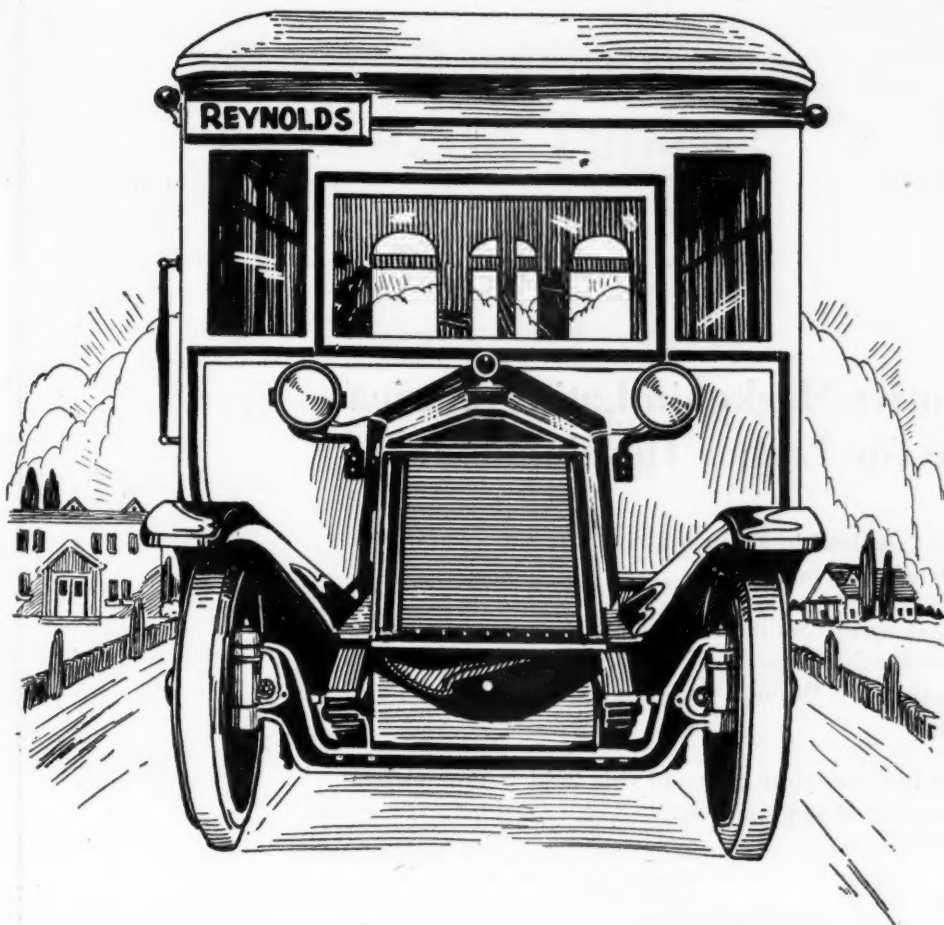
getting and keeping the attention of the country's big motor truck fleet owners, it is unparalleled, for these fleet owners will retain this number for reference during 1923.

Far sighted manufacturers who look to these fleet owners for a portion, or all, of their business will not overlook the opportunity to get their message over in a convincing way in this January 15th number. Incidentally, this issue also affords an excellent beginning for a strong campaign in this field during the coming year.

Copy and cuts should reach us as much in advance of closing date (January 9th), as possible, to insure best attention and position. Our Service Department will gladly assist in preparation of copy. Rates and other data will be promptly furnished on request. *Make your reservation now!*

Forms Close January 9th, 1923

THE COMMERCIAL VEHICLE
239 West 39th Street
New York, N. Y.



Making Good Coaches Still Better

Coach builders who strive for the best in construction and who realize how vitally important the front axle is to the successful service of a motor coach, place their trust in SHULER FRONT AXLES.

SHULER FRONT AXLES are built by an organization that specializes in front axles exclusively for motor coaches, trucks, tractors and trailers. Our engineers are at the service of manufacturers who want to make a good vehicle better by using these specialized and highly perfected units.

SHULER AXLE COMPANY

INCORPORATED

Front Axles for Trucks, Tractors and Trailers

3001 Jones Street

Louisville, Kentucky



Automotive Market in Latin America Due for Larger Development

"We have not realized in an automotive way the possibilities of the roads already built."

This comment upon conditions in South America was made by one of our leading export executives upon his return from a three months' trip through Argentina, Brazil, Chile, Peru and Uruguay.

The time to increase your effort in this field is now—when the spring season is approaching.



**El Automóvil
Americano**
Automoviles · Camiones · Moto-Cicletas · Aeroplanos · Tractores

Published by

The Class Journal Co.

239 West 39th Street

New York

The Rollers in GILLIAM Tapered Roller Bearings are contained within a clean-cut, one-piece, steel stamped cage flanged inward on the small diameter, thus insuring rigidity and durability.

Axle manufacturers using Gilliam Tapered Roller Bearings include: Adams, Clark, Columbia, Flint, Salisbury, Sheldon, Standard Equipment, Torbensen, U S, Vulcan, Wisconsin.



THE GILLIAM MFG. CO. - - Canton, Ohio

Cups, Cones, Rollers
ALLOY Steel
THROUGHOUT



A. I. 12-28-22

Minnesota Mining & Mfg. Co.
797 Forest St.,
Saint Paul, Minnesota

Please send us samples and full information regarding your "3 M" Waterproof Sandpaper.

Name

Address

State whether trial will be used on varnish or surfacer.



REG. U. S. PATENT OFFICE

WET OR DRY

REG. U. S. PATENT OFFICE

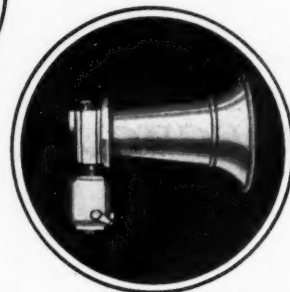
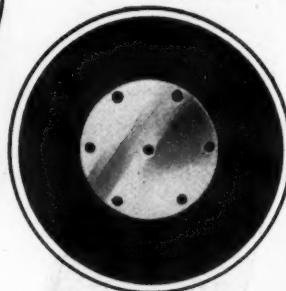
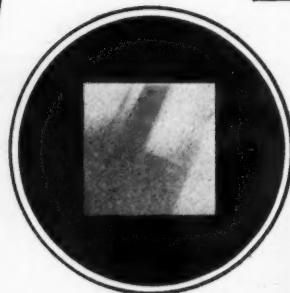
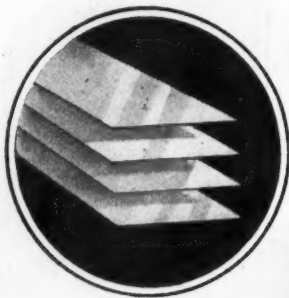
SAMPLES

Will be sent upon request to Automobile Manufacturers, Body Builders, or Repainters interested in a successful waterproof sandpaper.

Used with water, it is already replacing oil sanding and pumice rubbing in several automobile and body plants; is highly recommended by varnish manufacturers, and in letters we have received is declared the greatest improvement ever offered the industry.

We stand the expense of your investigation. The samples are free.

USE THE COUPON



Horn Diaphragm made of LANCASTER Special Alloy Strip STEEL

COLD ROLLED STRIP STEEL,
Alloy, High & Low Carbon
for
Brake Bands - Diaphragms
Clutch Discs
Shoe Shanks

Other Quality Products
COLD DRAWN WIRE & BARS
Spring Wire - Ball Steel
Drill Rod - Spoke Wire
Special Axle Steel

LANCASTER STEEL PRODUCTS CORPORATION

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HARTFORD

DETROIT

BUFFALO

NEW YORK

PHILADELPHIA

DULUTH
405 ALWORTH BLDG.

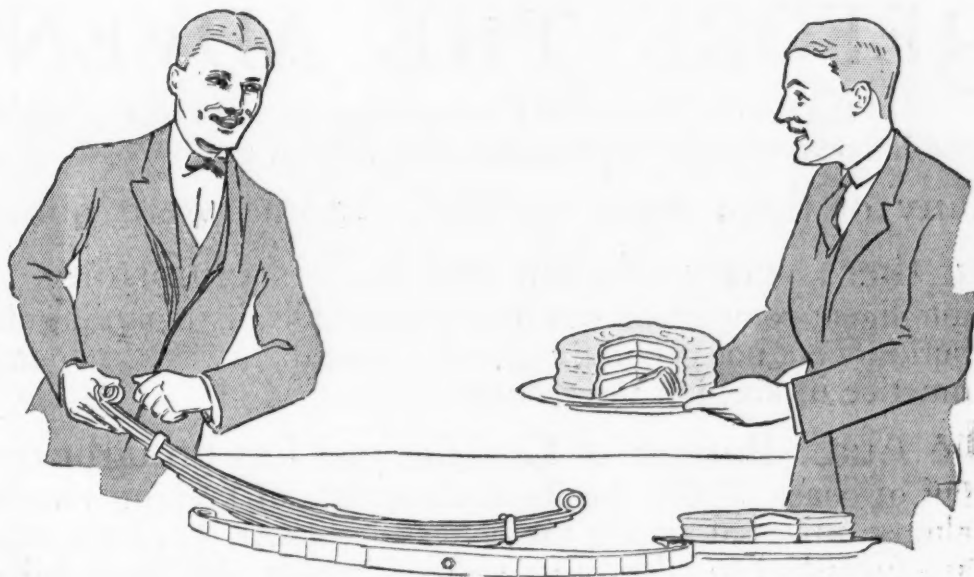
CHICAGO

PERFECTION

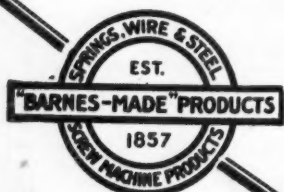
S P R I N G S



IT takes knowledge and care and a certain amount of devotion to an ideal to make even such prosaic things as springs—and make them really good. That's why Perfection Springs made to the same specifications as others are often so vastly different, just as cakes made to the same recipe by two different cooks. And it doesn't take a highly trained inspector to detect the difference, in either case.



THE PERFECTION SPRING COMPANY
CLEVELAND, OHIO



The Wallace Barnes Company

"Spring Makers for Three Generations"

Main Office and Works - Bristol, Conn.
Western Office—6400 Miller Avenue, Detroit

BEFORE THE ADVENT

of the Audit Bureau of Circulations in 1914, each publisher made his own circulation statements to advertisers.

Many of them were truthful. Some were not.

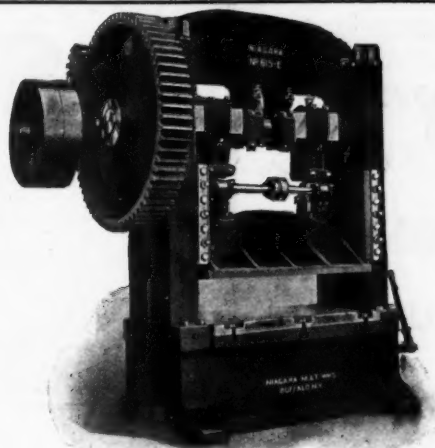
But there was confusion and lack of uniformity. An intelligent comparison was impossible. Details regarding distribution were not generally given because there was no standard of practice in keeping the records.

The Audit Bureau of Circulations has brought order out of chaos. Today the Bureau's system of keeping records is almost universal among the better publishers. Uniform reports are furnished to advertisers verified by that absolutely independent organization.

The experienced advertiser demands A. B. C. reports and if the publisher has nothing to hide, he gets them.

A. B. C. reports in Automotive Industries are furnished on request.

**Lower
Costs**



**and
Maximum
Production**

615E Double Crank Press

Sheet Metal Machines and Tools

Are you getting the maximum output with the minimum costs? Can you replace expensive castings with metal stampings or drawn metal parts? Let our Engineering Department—over 43 years' experience—help you to reduce your costs and increase

your production; you are under no obligations in doing so.

We are manufacturers of presses, punches, squaring shears, ring and circle shears and tinner's tools. Ask for catalog.

NIAGARA MACHINE & TOOL WORKS

BUFFALO, N. Y.

Established 1879

U. S. A.

NIAGARA

60161



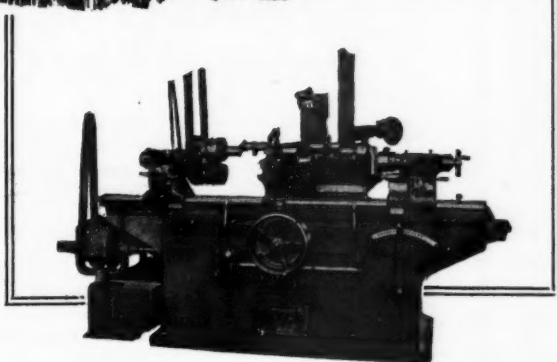
Be Sure It's a Service Station Grinding Machine

Not all grinding machines are suitable for your service stations—this particular Landis is especially so. It has everything to make it a success in the hands of garage mechanics.

Quick and easy changing from one job to another.

A crankshaft one hour—a set of pistons another. Then a set of valves, or tappets or whatever comes along.

Made by grinding machine specialists of many years' experience. Country-wide Landis Service.

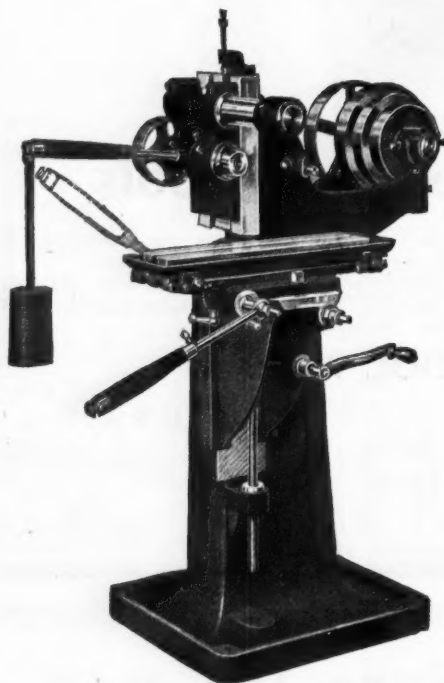


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LANDIS TOOL CO., WAYNESBORO, PA.

New York Office, 51 Chambers St.

**THE
"WHITNEY"
HAND
MILLING MACHINE
THOUSANDS IN USE**



PROMPT DELIVERIES

Don't forget that the greatest demand for the

"WHITNEY"

comes from big plants manufacturing interchangeable work, where rapid, accurate and economical production are absolutely essential.

One manufacturing concern has ordered over 700 of these machines. Many others have over 100 each.

THE WHITNEY MFG. CO.
Hartford, Conn.

CHAINS, KEYS and CUTTERS
HAND MILLING MACHINES

FOREIGN AGENTS

Burton, Griffiths & Co., Ltd., London
Fenwick Frères & Co., Paris
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DEALERS:

Your customers will appreciate
SUPREME AUTO OIL

Frozen oil in the crankcase plays
havoc with bearings and batteries.

Write Us.

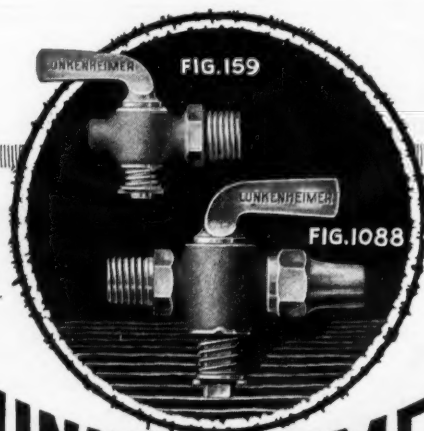
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General Sales Offices: Pittsburgh, Pa.

DISTRICT SALES OFFICES:

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Ground Key Cocks

For Gasoline, Oil, Air and Drain Service, particularly adaptable for Automotive use. Male or female pipe threaded ends, soldering or flared tubing union connections.

Spring Key Pattern provides self-adjustment, though easily operated key.

The comprehensive line of Lunkenheim Ground Key Cocks for all classes of service is thoroughly illustrated and described in Booklet 522-HK. Write for a copy.

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QUALITY
LARGEST MANUFACTURERS OF
HIGH GRADE ENGINEERING SPECIALTIES
IN THE WORLD
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GEARING

GEARING

Worn-out Gear Teeth—

THE REMEDY

Everything wears out—even gear teeth.
But some wear too rapidly.

"Van Dorn" Gears stay on the job.

The reason is obvious.

A complete analysis of the gear application dictates the most suitable material to use, the proper method for cutting or generating the teeth, and the production of high quality gears that stand up under the most severe usage.

It's all in knowing what is required and the facilities for performing the work.

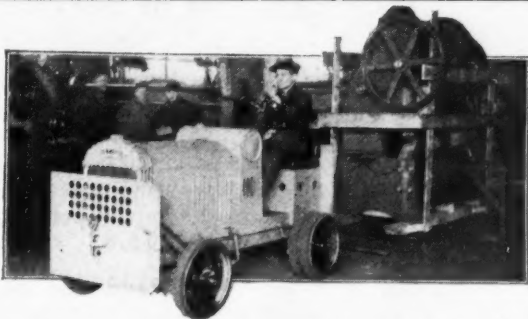
"Van Dorn" is prepared to handle many gear problems.

Why not let us analyze your gears? Send prints or rough sketches.

Gear Craftsmen Since 1897

THE VAN DORN & DUTTON CO.
GEAR SPECIALISTS
CLEVELAND OHIO, U.S.A.

THE TOWING MOTOR OF INDUSTRY



THE value of a product, such as the TOWMOTOR, becomes distinctly prominent when it is supported by a long list of satisfied users who testify to its economy of up-keep—saving of time and manpower—and dependability throughout.

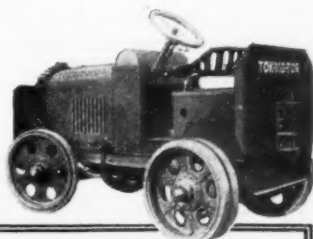
A large iron works says: "The TOWMOTOR is doing the work of five men and one team in our plant, is working every day and giving very satisfactory service." All claims for the TOWMOTOR are supported by any number of such letters from well known organizations in various parts of the country. A lengthy list of satisfied users tell the complete story of the TOWMOTOR.

A few more prominent users:
Hadfield Penfield Steel Co.
Messman Schultz
Cleveland & Buffalo Transit Co.
Batavia, Java
Robertson-Cole Co.
Western Transport Co., Liverpool, England

The superiority of the TOWMOTOR has been proved in service. Write for complete list of users and their comments on the savings it affords.

The Towmotor Co.

Cleveland, Ohio



The Towmotor has Made Good

We are Playing Square with YOUR Customers By Playing Square with YOU—

As far as piston rings are concerned we could make a lower quality ring that would get your cars out of the factory satisfactorily, rings that could "get by." And that would mean more immediate profits to us too. But if your customers get a continued high class motor performance over a period of years, they are going to be satisfied. Then you are going to be satisfied and pleased with your piston ring source. Although we are the last in line to profit, that is the way we prefer to do business.



Oil pumping or loss of compression after only a few months service is one evidence of ordinary piston rings. That condition is neither necessary nor fair to your customer—and it is unknown among those we serve. Over twelve years of 100% satisfaction is behind the General Piston Rings you get today. And although your car owners cannot specify the piston rings you should use—their continued satisfaction is both your best asset and ours.

And General Piston Rings cost no more.

**GENERAL
PISTON RING COMPANY**

Indianapolis, Indiana

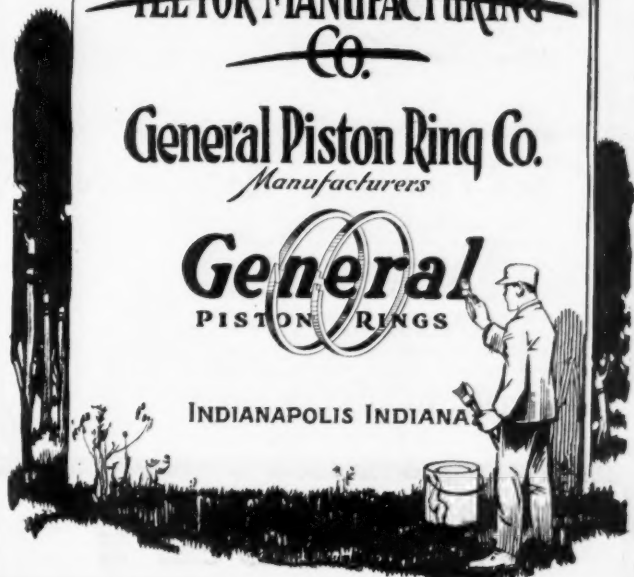
*A Change
in NAME only*

~~TEETOR MANUFACTURING
Co.~~

General Piston Ring Co.
Manufacturers

General
PISTON RINGS

INDIANAPOLIS INDIANA



This is Real Economy!

Castings are such a vital part of the car, truck or tractor that it is a matter of ultimate economy to buy from a source where unflinching quality is assured.

For not only do castings, that are exactly up to specifications, make for a bet-



ter product and one that will give greater satisfaction in service, but they also help to cut production costs since no expensive machining is necessary.

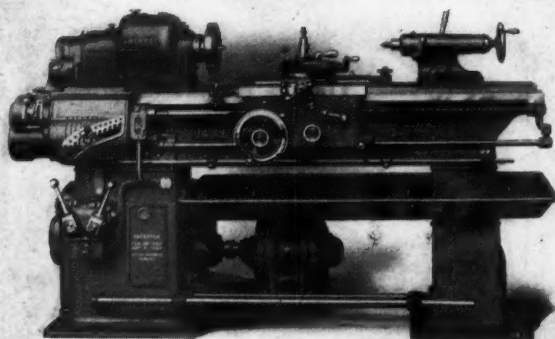
You can buy Cheney Castings with Absolute Confidence because they are made right by men who know how to make them right.

Put your casting problems up to Cheney—he will solve them.

This is real economy.

Cheney and Son
Manlius, N. Y.

CHENEY
GRAY IRON CASTINGS



New Principle of Motor Drive

This HENDEY 1922 design 14" lathe is driven by a constant speed motor through speed change gears running in oil tight box located in cabinet leg. From here the drive is by enclosed belt to spindle. Not a geared head lathe. 9 spindle speed changes obtained in speed box and 9 through spindle back gears. Belt pull on spindle is downward opposing upward thrust of heavy cuts. Foot treadle for momentary stopping by releasing belt tension. Ask for special folder of 1922 design.

THE HENDEY MACHINE CO.
TORRINGTON, CONN.

HENDEY

There's a wonderful talking point in the fact that Hoover Balls are practically the unanimous choice of the industry.



**The World's Largest Plant Manufacturing
Steel, Brass, Bronze, Monel, Aluminum
and Hollow Balls**

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Philadelphia.....289 Middle City Bldg.
Cleveland.....3124 Edgehill Road
Chattanooga.....Sanford Bros.

The Test of Service

Considering the heavy service requirements placed upon truck transmissions and clutches, and the abuses to which they are subjected in the hands of careless and ignorant drivers, engineers will then be interested in the repair percentage tabulations given below.

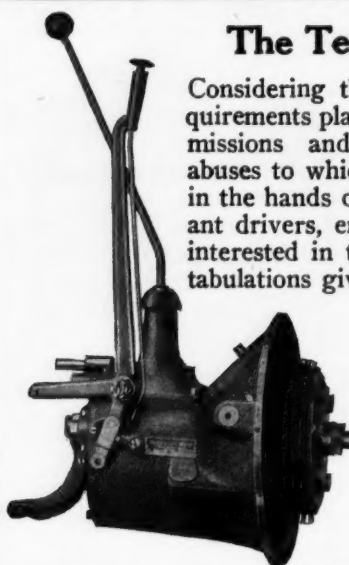
Read the Story

The following table is an actual record of the repairs on REPUBLIC trucks made by the Roberts Motor Car Company, REPUBLIC distributors, at Portland, Oregon.

There were 317 separate jobs which passed through their shops and the following table shows the percentage of repairs from the different parts of the trucks:

Transmission (FULLER).....	1.26%
Clutch (FULLER)	5.66%
Springs of all kinds.....	1.26%
Frame, all kinds.....	1.56%
Shift spring, rear axle, all causes.....	2.50%
Shift spring, front axle, all causes.....	2.52%
Rear axle, except brake.....	6.00%
Steering gear, repairs all kinds.....	6.00%
Propeller shaft and Universal joints.....	8.20%
Brakes	11.34%
Engine repairs, all kinds.....	53.70%
TOTAL	100.00%

FULLER & SONS MFG. CO., Kalamazoo, Mich.





WHY PERMIT ANY TREMOR CAUSED BY UNBALANCE?

There is no necessity for

Vibrations

in an automobile, caused by unbalance of crankshaft, flywheel or clutch-housing.

The driver is not the only occupant of the car who becomes forcibly aware of "engine periods," altho probably most responsive thereto.

*Let us eliminate vibration
in your cars.*

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OIL PANS
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GAS TANKS
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Detroit Office: 712 Dime Bank Bldg.

Chicago Office: 352-358 W. Ohio St.

G.P.&F.SERVICE
"KNOWING HOW SINCE '81"

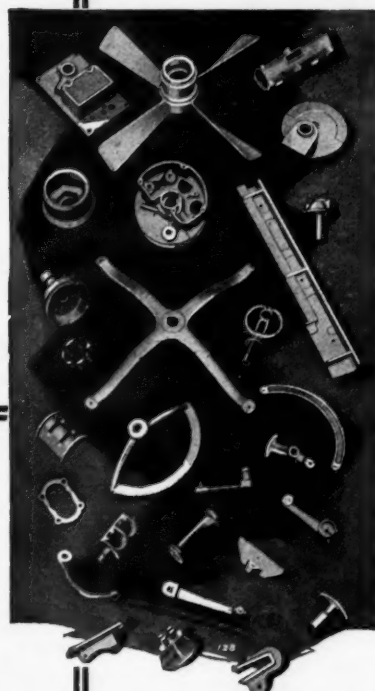
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The World's Largest Producer of

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Success in the largest sense can come only to the manufacturer who understands not his own business alone but also the needs of the various businesses he serves. Only out of such knowledge can come the full measure of the service a buyer has a right to expect. An experience of 17 years in the production and use of die-castings—daily contact with hundreds of industries where die-castings are used—unceasing research, experiment and development—the constant operation of the largest plants in the industry—these are some of the factors contributing to the mastery of the art which has made Doehler the world's largest producer of die-castings. Every Doehler Die-Casting is a master casting.

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Doehler die-cast automotive parts—accurate, uniform, high in quality.

**BRYANT CHUCKING GRINDER
COMPANY**

Springfield, Vermont



U. S. PAT. OFF.

Builders of

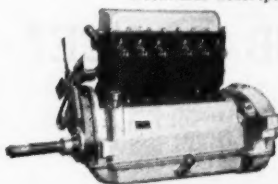
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Hole and Face Grinders
Deep Hole Grinders

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Power plants for the heavier and better class of passenger cars, and heavy duty types for truck and tractor service.

Built particularly to meet the exacting demands for power and endurance in high grade vehicles. Have successfully met these demands for over 20 years.

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THRUST Ball Bearings,
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to your requirements and
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Cudahy (Suburb of Milwaukee), Wis.
The Axle Forgers of The Industry

LADISH
QUALITY
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CLIMAX

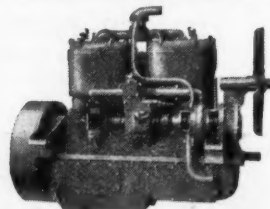
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Gasoline or Kerosene

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FORMED TO ANY SPECIAL SHAPE

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We are in position to manufacture to your specifications from your blueprints in any quantity, promptly.

May we submit prices on your requirements?

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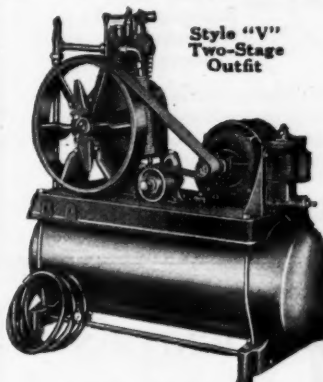
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Two-Stage Compressor with a Copper Intercooler

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Screw Machine Products —to your order!

Of proper material;
Turned on the finest modern machinery;
Designed with utmost care and precision.
In brass, steel, or German silver.
Any shape from "rod" up to 1 1/2" in diameter.

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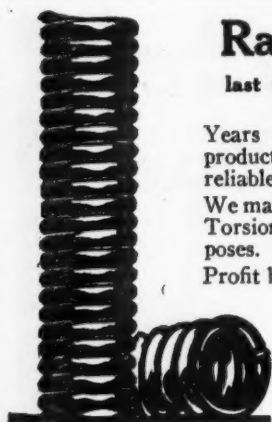
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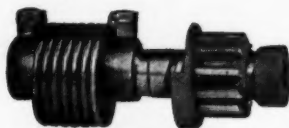
See our exhibits at New York Auto Show, Jan. 6 to 13; at Chicago Auto Show, Jan. 27 to Feb. 3.

Write for further information.

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for ELECTRIC
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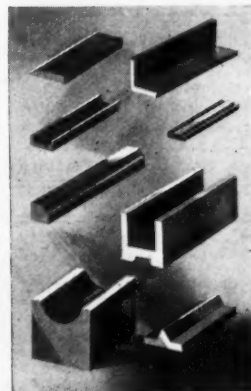


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can be furnished in
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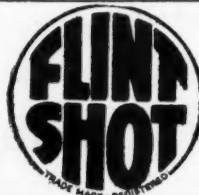
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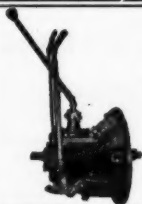
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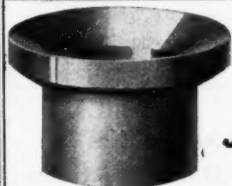
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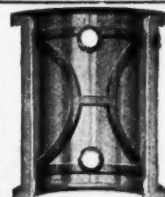
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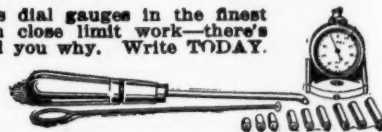
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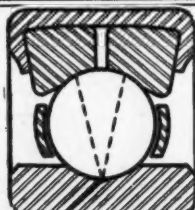
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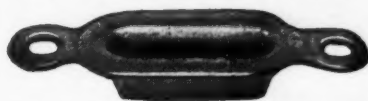
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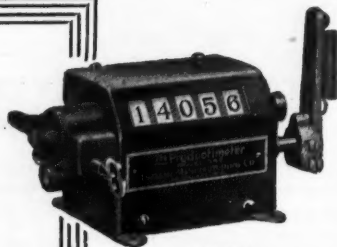
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Milwaukee, Wis.

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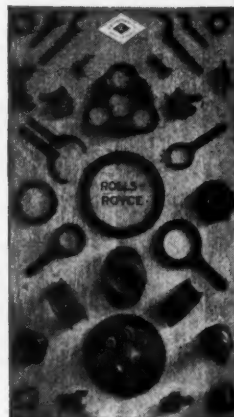
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Quality



When you adopt Williams' Superior Drop - Forgings for your special parts, you eliminate the danger of breakage so far as is humanly possible. Why not profit by the experience of nearly half a century, and all that this implies in the way of a highly specialized organization of skilled craftsmen;—write us.

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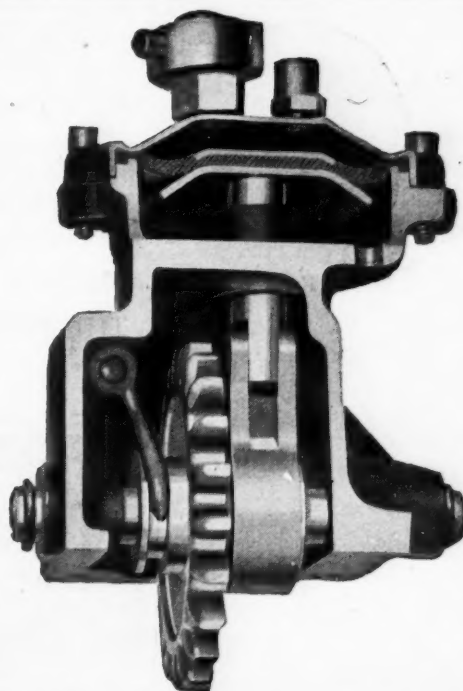
"The Drop-Forging People"

BROOKLYN
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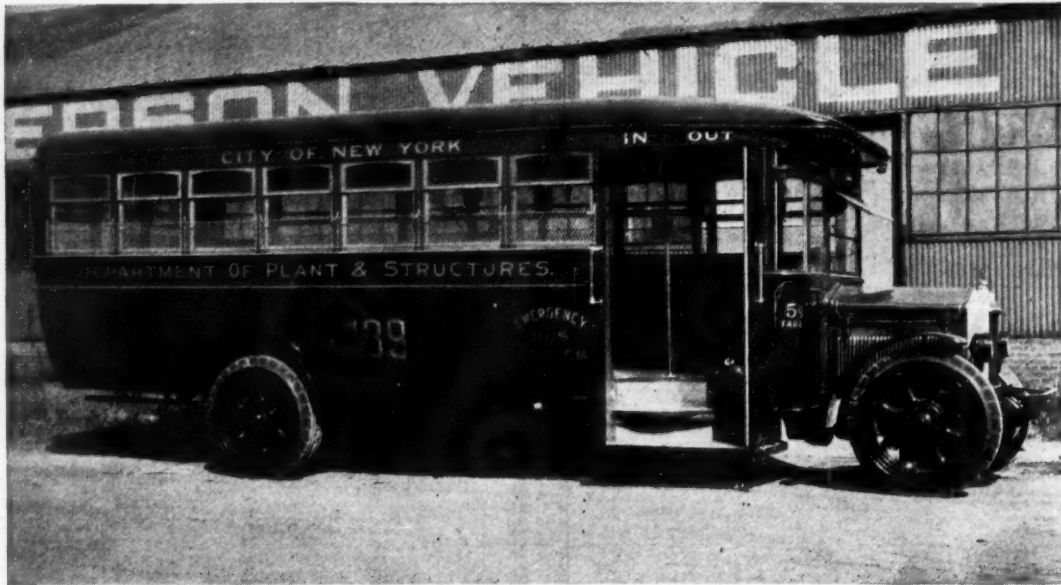
BUFFALO
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CHICAGO
1010 W. 120th St.

DETROIT DIAPHRAGM TIRE PUMP



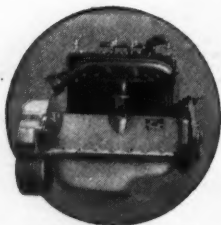
DETROIT CARRIER & MFG. CO.
DETROIT, U. S. A.



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More than 100 manufacturers have standardized on the Buda

At present 67% of the automotive equipment made in this country is built with *specialized* units. To take utmost advantage of the steady, economical power delivered by a *specialized* engine, more than 100 manufacturers have standardized on the Buda. Its long life and low-cost, troublefree performance is a matter of record in every type of hauling. Buda reliability is a product of our forty-one years' experience in the making of good transportation equipment. Upon receipt of your truck, motor coach or taxicab specifications we will gladly submit engine recommendations.



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A PURPOSE

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ESTABLISHED 1881

Buda Parts Stations Blanket the Country

BUDA

The
ENGINE

COTTA

TRANSMISSIONS

GEARS ALWAYS IN MESH

Guaranteed Against Stripping

The COTTA Transmission is always absolute master of the situation when speed changes are necessary on hills or in heavy traffic.

Changes and pick-up are effected instantly; the driver does not have to feel for his gears and lose speed—often kill his engine—because the gears are always in mesh.

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Made in three or four speeds—both in the unit power plant and amid-ship types—also for chain drive.


COTTA TRANSMISSION CORPORATION
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FOR TRUCKS
TRACTORS, BUSES

FIRE APPARATUS
INDUSTRIAL LOCOMOTIVES

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or many years the Long Manufacturing Co. have been building radiators for motor cars, trucks and tractors.

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Because, from the very inception of the industry, engineers and manufacturers have ever been alert for improvements that provide easier, quieter and smoother car operation—and this Long Clutch accomplishes these requisites to a degree never before attained.

Details and specifications will be furnished to engineers and manufacturers upon request.

LONG CLUTCH

LONG PRODUCTS
Radiators and Clutches

Long Manufacturing Company, Detroit, Michigan
